PESTICIDES ABSTRACTS

August 1977 - Vol. 10, No. 8
Abstracts 77-1571-1819
PSTAB 10(08): 411-466 (1977)

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 10 **August 1977** **No. 8**

Page

General 411
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 415
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 422
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 435
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 460
(Preparation of samples; analytical methods; instrumentation)

77-1571. Canonica, L. (Ist. Chim. Organ., Univ. Milan, Italy). **Seveso: considerazioni e commenti. [Seveso:considerations and comments.]** *Chim. Ind. (Milan)* 59(2): 87-89; 1977. (Italian)

The actions of Italian governmental agencies and other bodies following the widespread TCDD (dioxin) contamination at Seveso have been criticized as too drastic, not drastic enough, or unsatisfactory in other ways in the course of the public outcry after the accident. Less urgent problems have now come under consideration, such as decontamination of buildings in Seveso. Soil decontamination remains a major problem, although it appears that dioxin movement in soil will not be extensive. Chemical, physical, and microbial agents are being examined to enhance dioxin degradation in soil. The process of creating legislation aimed at preventing disasters of this type from occurring in the future will be prolonged.

77-1572. Wada, O. (Sch. Hyg., Fac. Med., Tokyo Univ., Tokyo, Japan). **[Ecotoxicology.]** *Igaku No Ayumi (Progr. Med.)* 100(1): 210; 1977. (Japanese)

Ecotoxicology is defined as the branch of toxicology pursuing the effects of chemicals which circulate in the ecosystem (including mankind) from qualitative and quantitative view points. Chemical toxicity and adaptation to the toxic effects are complicated by the fact that recently introduced chemicals affect the living organisms more intensely in smaller amounts. Biological accumulation and food chain transport are the most important problems in ecotoxicology of, for instance, DDT, PCB, and methyl mercury. The qualitative changes in chemicals during their circulation in the ecosystem are also very important, for instance, release of elemental metals, biotransformation, and biological activation. Mutual reaction between simultaneously present chemicals is also not negligible. Thus, ecotoxicology is considered to be an important tool in environmental science.

77-1573. Wronkowski, C. (Author address not given). **Proces chemizacji srodowiska przyrodniczego. [Environmental pollution.]** *Gaz Woda Tech. Sanit.* 51(1): 26-28; 1977. (31 references) (Polish)

The sources of environmental pollution (including pesticides), which constitutes a serious problem for civilization, were discussed. Pesticides are found in increasing quantities in plants and animals. Their hazardousness was attributed to their stability and strong biological activity. Even after years, they do not always undergo biodegradation. They are poorly soluble in water, but are readily taken up in adipose tissue, where they accumulate in considerable concentrations. As a result of insecticide application, weak and susceptible insects were destroyed while stronger pests were liable to remain alive and acquire resistance. This resulted in the danger of growing numbers of agressive pests, more and more difficult to control. It was also established that agricultural pollution led to a continuous reduction of useful insect species, threatening dangerous changes in nature. It has been realized that the problems of ecological pollution are not limited to production and technology alone, but also involve a moral obligation to future generations. A decisive part in a hopefully favorable solution of these problems will be played by the actions of chemists and biochemists.

77-1574. Sadowska, H. (Author address not given). **Zanieczyszczenia w zywnosci. XI Sesja Komisji, Kodeksu Zywnosciowege FAO/WHO W Rzymie. [Food contamination; 11th Meeting of the FAO/WHO Codex Alimentarius Commission in Rome.]** *Przem. Spozyw.* 31(1): 10-13; 1977. (Polish)

A report on a World Health Organization meeting with the objective of developing internationally acceptable standards for food contamination is presented. This process would require knowledge and assessment of the type and degree of toxicity caused by the contaminants in food, information about ways of their penetration into food, means to reduce them, and data on their ADI (acceptable daily intake). A global environmental monitoring system was established to watch out for food contamination. Apart from verifying pollution with microbiological organisms, mycotoxins, metals and industrial chemical compounds, maximal limits of pesticide residues were established subject to periodic reviews and revisions by the supervisory commission. Methods of appropriate sensitivity to detect pesticide groups and to determine individual compounds were worked out applying to many types of pesticides. Qualified laboratories all over the world were assigned the task of undertaking development programs for these methods.

77-1575. Marquez Mayaudon, E. (Author address not given). **Los plaguicidas agricolas y la contaminacion ambiental. [Pesticides in agriculture and environmental pollution.]** *Salud Publica Mex.* 17(6): 829-834; 1975. (Spanish)

A survey is presented on the use and production of pesticides, their toxicity in humans and animals, and their presence as pollutants in soils, water and air. The decreasing insecticidal effect of DDT due to development of genetic resistance in insects contrasts with the increasing toxicity in humans due to accumulation in tissues. The high toxicity of various types of insecticides, rodenticides, fungicides and herbicides is mentioned, and its diminution or suppression by biodegradation is stressed. The short or long range accumulation of pesticide residues in plants and animals and their consequent danger for humans is analyzed. Pesticides contamination of soils, water and air, their level of accumulation and interrelation with biological entities is then surveyed. The importance of controlling the manufacturing, distribution, and use of toxic pesticides in Mexico is stressed. Increased use of pesticides with low human toxicity is advised.

77-1576. Christensen. R. G. (Region V. Environ. Protect. Ag.. Chicago. IL). **Non-point source pollution seminar. Section 108(a). Demonstration projects (pollution control in Great Lakes).** *Natl. Tech. Inform. Serv.* PB-250.970. 1975. 266 p.

Topics covered include: the challenge to American agriculture of P.L. 92-500; from a national viewpoint - focus on 'political rulings as they affect NPS programs'; overview of USEPA research and development as it relates to NPS pollution; USEPA involvement in management of section 108(a) projects; conservation farm planning; impact of social attitudes on managing the environment; tillage and simulated rainfall studies; uses of pesticides and fertilizers in the Black Creek Watershed; sediment contributions to the Maumee River; Streambank stabilization; sediment trap for measuring sediment load; grassed waterway design; nutrient contributions to the Maumee River; effects of land treatment on the aquatic environment; computer monitoring of environmental conditions in a watershed; projection of environmental conditions in a watershed; project management and land treatment costs; red clay area project; and Washington County project. (Author abstract by permission)

77-1577. Seltzer. R. E.; Fly. C. L.; Schneider. E. O. (Develop. Plan. Res. Assoc. Inc.. Manhattan. KS). **Incremental cost impacts of the 1972 Federal Insecticide, Fungicide and Rodenticide Act as amended.** *Natl. Tech. Inform. Serv.* PB-250.963. 1976. 167 p.

This study attempts to evaluate the economic impacts of 1972 Federal Insecticide. Fungicide. and Rodenticide Act as amended on the pesticide industry. pesticide users and consumers and will describe inflationary impacts which may result. Specific tasks included are as follows: (1) Identification of pesticide categories. use types and geographic areas that will be most affected. (2) Evaluation of economic impacts on the pesticide industry. (3) Quantification. under varying assumptions. of any cost increases to pesticide users. (4) Quantification. under varying assumptions. of any cost increases to consumers of final products. (5) The overall assessment of all costs and benefits to society attributable to the implementation of selected sections of 1972 FIFRA as amended. (Author abstract by permission)

77-1578. Kennedy. R.; Lowrey. R.; Bernstein. A.; Reuter. F. (CONSAD Res. Corp.. New York. NY). **A benefit-cost system for chemical pesticides.** *Natl. Tech. Inform. Serv.* PB-250.988. 1976. 335 p.

The application of benefit-cost analysis in the registration of chemical pesticides is developed. A comprehensive benefit-cost system. designed to be used both in registration of new pesticides. as well as in the reregistration of existing pesticides. is described. It is a workable system. not an ideal one; that is. it reflects the current state-of-the-art and it uses the presently available data. As technology improves. more data become available. and knowledge increases. components of the system can be upgraded to reflect these changes. Nevertheless. the present system is intended to provide convenient. summary formats of the most prominent indicators of benefits and costs. so that all benefits and costs. especially those which are conceptually and empirically difficult to measure — such as long-term human health and indirect environmental effects — are formatted and depicted in the most comparable presentation possible. (Author abstract by permission)

77-1579. Caswell. R. L.; Alexander. M. L.; Boyd. H. (Criteria Eval. Div.. Environ. Protect. Ag.. Washington. DC). **Acceptable common names and chemical names for the ingredient statement on pesticide labels — third edition.** *Natl. Tech. Inform. Serv.* PB-251.005. 1975. 187 p.

This report is an alphabetical listing of common and chemical names of active ingredients. to be used on pesticide labels. This is the third edition. Reference is made in the Proposed Guidelines for Registering Pesticides to 'Acceptable Common Names and Chemical Names for the Ingredient Statement on Pesticide Labels'. (Author abstract by permission)

77-1580. Midwest Res. Inst. (Kansas City. MO). **Substitute chemical program. Initial scientific review of cacodylic acid.** *Natl. Tech. Inform. Serv.* PB-251.541. 1975. 130 p.

Cacodylic acid was identified as a registered substitute chemical for certain cancelled and suspended uses of 2.4.5-T. The report covers all uses of cacodylic acid and is intended to be adaptable to future needs. Should cacodylic acid be identified as a substitute for a problem pesticide other than 2.4.5-T. the review can be updated and made readily available for use. The data contained in this report was not intended to be complete in all areas. Data searches ended in March. 1975. The substitute chemical is reviewed for suitability considering all applicable scientific factors. such as chemistry. toxicology. pharmacology. environmental fate and movement. use patterns and efficacy. (Author abstract by permission)

77-1581. Midwest Res. Inst. (Kansas City MO). **Substitute chemical program. Initial scientific review of MSMA/DSMA.** *Natl. Tech. Inform. Serv.* PB251.566. 1975. 124 p.

The substitute chemical is reviewed for suitability considering all applicable scientific factors. such as chemistry. toxicology. pharmacology. environmental fate and movement. use patterns and efficacy. The major objective of this report is to cover all uses of MSMA/DSMA and is intended to be adaptable to future needs. MSMA/DMSA were identified as registered substitute chemicals for certain cancelled and suspended uses of 2.4.5-T. The data contained in this report was not intended to be complete in all areas. Data searches ended in January. 1975. (Author abstract by permission)

77-1582. Von Rumker, R.; Carlson, G. A.; Lacewell, R. D.; Norgaard, R. B.; Parvin, D. W., Jr. (RvR Consultants, Shawnee Mission, KS). **Evaluation of pest management programs for cotton, peanuts and tobacco in the United States.** *Natl. Tech. Inform. Serv.* PB-251,662, 1975 118 p.

Nineteen cotton pest management programs, three peanut pest management programs and three tobacco pest management programs were evaluated in regard to the users, locations and characteristics of each program, program costs, program effects on crop yield, pesticide use, production costs and growers' profits. The environmental impact and the biological and economic feasibility of each program were studied, and constraints on the expansion of pest management programs and the applicability of the findings of this study to other crops were assessed. Most of the data were collected during the period July through September, 1974. The findings, conclusions and recommendations presented are based largely on the state of affairs as of the fall of 1974. (Author abstract by permission)

77-1583. Wilkinson, R. R.; Cooper, G. R. (Midwest Res. Inst., Kansas City, MO). **Study on chemical substances from information concerning the manufacture, distribution, use, disposal, alternatives, and magnitude of exposure to the environment and man. Task III. The manufacture and use of selected inorganic cyanides.** *Natl. Tech. Inform. Serv.* PB-251,820, 1976, 229 p.

The purposes of the study were to identify the production methods, importation, exportation, use patterns, and exposure to man and the environment of selected inorganic cyanides, including hydrogen cyanide, from 1965 to 1975. Data for the production methods included the specific process, raw materials, annual production quantities, major manufacturers, waste products, environmental management of process wastes, and other production data. Use patterns were identified and annual consumption data were compiled for each compound in the respective area of utilization. Major consumers in each use area were identified. Various possible methods for the exposure of man and the environment to inorganic cyanides were discussed and evaluated. Future production quantities and areas of usage were estimated to 1985. (Author abstract by permission)

77-1584. Durfee, R. L.; Contos, G.; Whitmoore, F. C.; Barden, J. D.; Hackman, E. E., III. (Versar Inc., Springfield, VA). **PCBs in the United States — industrial use and environmental distribution.** *Natl. Tech. Inform. Serv. PB-252,012, 1976, 488 p.*

This document presents the current state of knowledge about the production, usage, and distribution of polychlorinated biphenyls (PBCs) in the United States. The information presented is derived from detailed studies on the production and first tier user industries, the past and present generation and disposition of PCB-containing wastes, environmental transport and cumulative loads, potential alternatives to PCBs usage, inadvertent losses to and potential formation in the environment, and current regulatory authorities for PCBs control. These results indicated that, although PCBs content of industrial wastes can be reduced through various approaches (treatment, substitution, etc.), there exists a potentially severe future hazard in the form of large amounts of PCBs currently contained in land disposal sites. Further definition of this and other aspects of the PCBs problem, and determination of ways to minimize the hazard, are recommended. (Author abstract by permission)

77-1585. Leedy, D. L.; Franklin, T. M.; Hekimian, E. C. (Urban Wildl. Res. Ctr., Inc., Ellicott City, MD). **Highway-wildlife relationships. Volume 2. An annotated bibliography.** *Natl. Tech. Inform. Serv.* PB-253,422, 1975, 430 p.

The study assesses, primarily through an extensive literature review, what is known about highway-wildlife relationships and suggests research and management approaches to protect and enhance fish, wildlife, and environmental quality. The 20 million or more acres in highway rights-of-way have been largely neglected as wildlife habitat. Opportunities exist for creating valuable fish and wildlife impoundments during construction, yet the minimal effort needed to locate and design such impoundments has generally not been made. The Nation's four million miles of streets and highway often create 'edges' conducive to wildlife. Many millions of wild vertebrates are killed annually, but apparently most wildlife populations are not seriously affected by such losses. Highway construction through limited ranges of endangered species can be a serious problem, as can erosion, wetland drainage, stream alteration, structures which block the passage of anadromous fish, and pollutants resulting from highway maintenance and use. Volume 2 contains 794 references. (Author abstract by permission)

77-1586. Authur D. Little Inc. (Cambridge, MA). **Economic assessment of proposed toxic pollutant standards for manufacturers and formulators of aldrin/dieldrin, DDT, endrin and toxaphene.** *Natl. Tech. Inform. Serv.* PB-253,678, 1976, 62 p.

An assessment of the economic impact of proposed toxic pollutant effluent standards for the manufacturers and formulators of aldrin-dieldrin, DDT, endrin, and toxaphene (Section 307(a) of the Fed. Water Poll. Cont. Act) was performed, based on abatement cost data supplied by EPA. It was concluded that there will be no significant adverse economic impact upon prices, sales, profitability, employment or the end use markets for these pesticides. In aggregate, compliance will require additional investment in treatment facilities of $0.8-1.1 million with annualized total costs of $0.5-0.7 million. The impact on prices will be potential increases of no greater than 2.3½. The assessment includes descriptions of firms, plants, and markets for these pesticides; investments and operating costs for

the abatement technologies; evaluation of pricing for these products and potential adverse impacts. (Author abstract by permission)

77-1587. Finlay, D. J.; Siff, F. H.; DeCarlo, V. J. (Region VI, Environ. Protect. Ag., Dallas, TX). **Review of PCB levels in the environment.** *Natl. Tech. Inform. Serv.* PB-253,735, 1976, 143 p.

This study reviews the current PCB data base to assess the PCB levels in the environment on a national level; the full spectrum of PCB levels reported in man and the environment were of interest. Data were obtained from a number of national monitoring programs, the literature and many unpublished reports. The data examined was inclusive to December 1, 1975. It should be stressed at the outset that due to the complexity and difficulty of PCB identification and measurement, the levels reported are not really comparable between different investigators. This aspect could not be compensated for or identified in the data presented. (Author abstract by permission)

77-1588. Burruss, R. P., Jr.; Sargent, D. H. (Versar Inc., Springfield, VA). **Technical and microeconomic analysis of arsenic and its compounds.** *Natl. Tech. Inform. Serv.* PB-253,980, 1976, 242 p.

The role of arsenic (and its compounds) in the environment and in the economy of the United States was studied, to evaluate the need for and the projected effect of controlling its production, use, dissipation, and emission. The occurrence, chemistry, and toxicology were reviewed; the prevalence of arsenic as an impurity in commercial raw materials, processes, and products were systematically documented; the intentional commercial flow of arsenical products were quantified; the sources of pollution were identified and characterized; and the health hazards were evaluated. The intentional production and use of arsenic and its compounds is greatly exceeded by the quantities unintentionally mobilized by industrial activities. The arsenic currently in food and water presents no identifiable health hazard, and the present controls on arsenical products, by a number of Government agencies, appear adequate. Emissions to the air from high-temperature processes are large, particulate collection devices appear inadequate, and the dangers presented are of serious concern. (Author abstract by permission)

77-1589. Taylor, C. C. (Malibu, CA). **Chemical toxins pervade the country.** *Patient Care* 11(10): 25; 1977.

A letter to the editor regarding an article on occupational hazards maintains that it is not only the chemical industry workers who are exposed to health risks. Chemical contamination is widespread, and reports have indicated that everyone living in countries with chemical industries faces increased cancer risks. Pesticide spraying operations pose another threat; dioxin contamination of mothers' milk has recently been reported following herbicide spraying in the western United States. Dioxin has also been found in beef from areas sprayed with 2,4,5-T herbicides.

77-1590. Oppenoorth, F. J.; Besemer, A. F. H. (Landbouwhogeschool, Wageningen, The Netherlands). **Insekticiden en hun toekomst. [Insecticides and their future.]** *Chem. Weekbl.* 12 (suppl.): m99-m104; 1977. (11 references) (Dutch)

The disadvantages of insecticide use have now received as much attention as their advantages received several decades earlier. The development of resistance against insecticides remains a serious problem, though efforts are continuing to combat it. Environmental persistence and food chain accumulation is being combatted by development of more readily degraded compounds to substitute for persistent organochlorines such as DDT. The developments being most vigorously pursued at present are enhancement of selectivity, so that the toxic effects will be felt most strongly by the target organism, and integrated control programs in which natural enemies and pest or host cycles are employed to reduce the need for insecticides. The latter is particularly needed, since instances are known in which the use of insecticides was directly responsible for bringing about pest infestations by killing off natural enemies.

77-1591. Murai, T.; Igawa, H. (Natl. Inst. Agric. Sci., Min. Agric. Forestry. Tokyo. Japan). [**Photodecomposition of *S*-benzyl *O,O*-diisopropyl phosphorothiolate.**] *Agric. Biol. Chem.* 41(5): 803-809; 1977. (12 references)

Two main steps of photodecomposition were observed at the initial stage of the irradiation with ultraviolet light of Kitazin P in a thin film. One was the isomerization to a thionate. *O*-benzyl *O,O*-diisopropyl phosphorothionate. which was gradually hydrolyzed or oxidized to its oxygen analogue. The other step was the cleavage of the P-S bond to produce *O,O*-diisopropyl phosphonate and α-toluenethiol. the latter of which was degraded to produce α-toluenesulfonic acid via dibenzyl disulfide. and finally sulfuric acid and benzoic acid. *O,O*-Diisopropyl hydrogen phosphorothioate, *O,O*-diisopropyl hydrogen phosphate and benzyl alcohol were detected as hydrolyzates. Benzyl alcohol was further oxidized to benzoic acid via benzaldehyde. In addition to these compounds, *O,O,S*-triisopropyl phosphorothiolate, *O,O,O*-triisopropyl phosphorothionate, *O,O,O*-triisopropyl phosphate and benzyl isopropyl sulfide were also detected. (Author abstract by permission)

77-1592. Dequidt. J.; Erb. F.; Brice. A.; Colein. P.; Renard. C. (Lab. Toxicol. Hydrol.. Fac. Pharm.. 59045 Lille Cedex. France). **Evolution de quelques pesticides chez les vegetaux. Etude experimentale.** [**Fate of some pesticides in plants. Experimental study.**] *Ann. Fals. Exp. Chim.* 70(750): 77-85; 1977. (8 references) (French)

The accumulation and disappearance of pesticide residues were studied in soil. carrots. and radishes treated weekly for 11 wk. Pesticide levels in the vegetables increased throughout the treatment period. then gradually declined. Captan levels in carrot roots were negligible (< 0.1 μ g/g) by 4 wk after treatment was ended. Simultaneously with parathion. its degradation products paraoxon and *p*-nitrophenol were recovered from the plants; all of these compounds disappeared rapidly after treatment was stopped. Treatment with zineb and maneb resulted in increased quantities of the metals in the plants treated for long periods. The studies confirmed the necessity of stopping treatment several weeks before harvest to prevent the occurrence of residues.

77-1593. Nakamura. T.; Yamaoka. K.; Saito. T. (Agric. Chem. Res. Lab.. Sankyo Co.. Ltd. Yasu. Shiga Pref.. Japan). [**Studies on persistence of isoxathion I. Residue determination of isoxathion and its oxygen analog and preliminary studies on persistence of isoxathion in crops and soils.**] *Bochu Kagaku (Sci. Pest Contr.)* 42(1): 32-40; 1977. (10 references)

A procedure was developed for determining isoxathion in crops and soils and applied to examining residues of isoxathion and its oxygen analog, methylisoxathion, and fenitrothion in kidney beans and in a sandy loam soil under laboratory conditions. Crop and soil samples were extracted with acetone and transferred to hexane or partitioned in hexane/acetonitrile. The solvent was then evaporated and the residue taken up in hexane containing 15% diethyl ether. then cleaned up on a Florisil column. A gas chromatograph with a flame photometric detector or a flame thermionic detector was used for determination. For the oxygen analog prior to partitioning the acetone extract was evaported to dryness and the residue shaken with sodium sulfate solution and dichloromethane prior to hexane-acetonitrile partitioning. Triphenylphosphate or surecide (CYP) was used as the internal standard. Isoxathion was considerably more persistent than either fenitrothion or methylisoxathion. The 90% disappearance periods found were 80 days for isoxathion. 15 days for methylisoxathion. and 30 days for fenitrothion from soil. Isoxathion applied to leaf surfaces of vegetables was gradually absorbed and converted into water-soluble compounds.

77-1594. Staiff. D. C.; Davis. J. E.; Robbins. A. L. (Field Studies Sect.. Health Effects Res. Lab.. U. S. Environ. Protection Agency. Wenatchee. WA 98801). **Parathion residues on apple and peach foliage as affected by the presence of the fungicides, maneb and zineb.** *Bull. Environ. Contam. Toxicol.* 17(3): 293-301; 1977. (4 references)

Apple and peach trees were sprayed weekly over an 8-wk period with 0.03% parathion. 0.03% parathion followed by 0.1% maneb. or 0.03% parathion followed by 0.1% zineb. Water-wettable powder formulations of the pesticides were used. Foliage samples taken 1-7 days after each application and 1-45 days after the last application were analyzed by electron-capture gas chromatography and were examined for cholinesterase inhibiting activity. The data showed no significant effect of maneb and zineb on the rate of parathion decay on apple foliage. although with peach foliage there was a slightly greater reduction of parathion in the presence of maneb and zineb. On both types of foliage there was no measurable difference in the decay rate of parathion in the presence of the fungicides. and the fungicides had no apparent influence on the rate of degradation of paraoxon. Thus. the use of maneb and zineb in conjunction with parathion would not increase the hazard to crop workers exposed to residues during thinning or picking activities.

77-1595. Ware. G. W.; Estesen. B.; Kronland. W. C.; Cahill. W. P. (Dep. Entomol.. Univ. Arizona. Tucson. AZ 85721). **DDT volatization from desert and cultivated soils.** *Bull. Environ. Contam. Toxicol.* 17(3): 317-322; 1977. (2 references)

Two bare. virgin desert plots (Casa Grande loam soil type) and two cotton plots (Casa Grande loam) never previously treated with DDT were treated topically with DDT at a rate of 2.0 lb AI/acre. Pre- and post-treatment soil samples were analyzed using electron capture gas chromatography. In the desert plots. paper towelling laid across the soil received an average of 125 mg/m^2 DDT. while the soil received about 164 mg/m^2. In the cotton

plots, the sides of the rows received 115 mg/m² while the row middles received 94 mg/m². The deposit reaching the cotton field soil was 66% of that applied to the desert plots, the remaining 34% probably having been deposited on the cotton plants. In the desert plots, total DDT residues declined to about 20% of the original over a 12-mo period, while *p,p'*-DDT was reduced to about 8% of the original. In the cotton plots, total DDT accumulated in the row middles following irrigations and rain, while declining only 20% during 76 days of fall weather. Within that period, total DDT in the desert plots declined 63%.

77-1596. Ware, G. W.; Estesen, B.; Cahill, W. P.; Buck, N. A. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721). **DDTR relocation from cotton cultural practices.** *Bull. Environ. Contam. Toxicol.* 17(3): 323-330; 1977. (1 reference)

Over a 3-yr period, DDT was applied on a restricted basis to over 600 acres of cotton in Pinal County, Arizona. Airborne particulate matter as a carrier for total DDT residues (DDTR) was measured during several post-growing season cultural operations for 2 yr. Dust samples were analyzed by electron capture gas chromatography. The data indicated that all operations contributed to the off-target movement of particulate-associated DDTR. In the first year, the downwind collections of measurable DDTR were greatest after the mulching operation, followed by the stalk chopping and discing, planting, and harvesting operations. In the second year, the stalk chopping operation generated more than twice as much airborne particulate matter as the mechanical harvesting. Generally, in a dry agricultural area, any cultural procedure that disturbs the plant debris and immediate soil surface will relocate a substantial quantity of DDT residues by air movement of particulate matter to which these residues are attached.

77-1597. Mathur, S. P.; Saha, J. G. (Soil Res. Inst., Agr. Canada, Ottawa, Ontario, Canada). **Degradation of lindane-^{14}C in a mineral soil and in an organic soil.** *Bull. Environ. Contam. Toxicol.* 17(4): 424-430; 1977. (25 references)

An aqueous suspension of lindane-^{14}C (3.27 mg in 10 ml distilled water) was added to flasks containing 100 g portions of mineral or organic soil. The soils were maintaned at 2/3 of their field moisture capacities or under submerged conditions. They were allowed to stand at room temperature in the dark for 8 wk, after which they were analyzed by gas chromatography/mass spectrometry and liquid scintillation counting. The recovery of ^{14}C-labeled residues from the moist soils was nearly 100%, but was only about 90% from the submerged soils. Hydrophilic degradation products, such as chlorophenols, were not produced in significant amounts. About 86-89% of the added lindane was recovered from the organic soils as compared with 70-84% from the mineral soils. Thus lindane was biodegraded more slowly in the organic soil than in the mineral soil. Chlorobenzenes, γ-PCCH, γ-BTC, *m*- and/or *p*-dichlorobenzene, 1,3,5-TCB, and pentachlorobenzene were recovered from the soils, the metabolites recovered from the moist soils differing somewhat from those recovered from the submerged soils. γ-PCCH was the major metabolite present in the moist mineral soil.

77-1598. Martens, R. (Institut fuer Bodenbiologie, Forschungsanstalt fuer Landwirtschaft, D3300 Braunschweig, Germany). **Degradation of endosulfan-8,9-^{14}C in soil under different conditions.** *Bull. Environ. Contam. Toxicol.* 17(4): 438-446; 1977. (8 references)

Air-dried, pulverized soil samples were treated with 10 ppm endosulfan-^{14}C in acetone and maintained under aerobic or anaerobic conditions. Some soils were mixed with an organic material prior to incubation and others were covered with distilled water prior to incubation. The formation of metabolites was determined by radio-thin layer chromatography. The recovery of radioactivity was 62-87% in most cases, but was only 40-65% for three of the flooded soils. Under aerobic conditions, endosulfate (30-60% of the applied endosulfan) was the major metabolite, the only other substantial metabolites being endodiol (2.6%), endolactone (1.2%), and an unknown metabolite(s) (1.1%). Endosulfate (11-22%) was also the major metabolite obtained under anaerobic conditions; endodiol (2.9%) and endolactone (1.9%) were also formed. Metabolites identified in the flooded soils were endodiol (2.2-18.4%), endosulfate (3.0-8.2%), and endohydroxyether (1.8-4.3%). For most soils, the rate of $^{14}CO_2$ generation was low (0.1-0.8%).

77-1599. Binkley, R. W.; Kirstner, G. L.; Opaskar, V. C.; Olynyk, P. (Dept. Chem., Cleveland State Univ., Cleveland, OH 44115). **Photochemical reaction of 2,4,5,6-tetrachloro isophthalonitrile.** *Chemosphere* 6(4): 163-166; 1977. (12 references)

An investigation of the photochemical group replacement reactions involved with the pesticide 2,4,5,6-tetrachloro isophthalonitrile is reported. The compound was dissolved in dry methanol and purged with nitrogen. After three hours of photolysis, the methanol was distilled and the acetone soluble portion of the solid residue was chromatographed. The first of the three fractions obtained contained two major components whose structures were identified as 2,5,6-trichloro isophthalonitrile and 2,5,6-trichloro -4- methylisophthalonitrile. The third fraction contained a mixture of two components, one being unreacted starting material, and the other being apparently a lactone with two possible structures of which spectral data and the degradation reaction allowed one to be assigned over the other. It is noted that in each case it was only the chlorine in the 4 position which was replaced.

77-1600. Crosby, D. G.; Moilanen, K. W. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616).

Vapor-phase photodecomposition of DDT. *Chemosphere* 6(4): 167-172; 1977. (21 references)

In an effort to determine whether sunlight may play an important role in the environmental destruction of DDT and DDE, the possible photolyzation of these compounds in the vapor state was studied. The UV irradiation of DDT resulted mainly in the formation of DDE with much smaller amounts of DDD and traces of other volatile substances. The half-life of DDT was about 6 days, but DDD vapor appeared stable to light. DDE vapor decomposed relatively slowly in light to yield primarily DDMU and DCB (4,4'-dichlorobenzophenone), although small proportions of at least 7 other products were also observed. Irradiation of DDMU in the photoreactor gave primarily DCB, while DCB in turn slowly formed dichlorobiphenyl; the chlorinated biphenyls were stable to irradiation in the vapor phase. The photochemical formation of simple chlorobiphenyls from DDT or DDE in solution has been noted in several previous investigations. That they do not occur appreciably in the environmental samples must be due both to their volatility and to their rapid photodecomposition in solution. Ambient air samples from Davis, California provided gas chromatograms with peaks corresponding to those of DDT, DDD, DDE (or its isomer) and DCB, but amounts were too small for mass spectrometric identification of PCB isomers.

77-1601. Sawinsky, A.; Pasztor, G. (Szolnok County Public Health and Epidemiol. Stn., Szolnok, Hungary). **Repulogepes permetezes uzemi expozicios viszgalata. [Exposure studies on pilots during aviochemical application.]** *Egeszsegtudomany* 21(1): 88-91; 1977. (20 references) (Hungarian)

Exposure of pilots to Reglone (diquat) and Sevin (carbaryl) were studied during agricultural spraying with a type PZL-101 airplane. Average pesticide levels in the cabin of the airplane during spraying were diquat 10 $\mu g/m^3$ and carbaryl 76 $\mu g/m^3$. Contamination of the pilot's skin with diquat was below detectable levels, while an average of 6.9 $\mu g/100\ cm^2$ was measured for carbaryl. The pilot did not display any subjective symptoms or clinical signs of pesticide exposure. Thus if the proper safety precautions are employed the aviochemical application of these two pesticides should not cause any acute injury to pilots of this aircraft type.

77-1602. Ehime Prefect. Hyg. Lab. (Matsuyama, Ehime, Japan). **[Results of environmental pollution monitoring using crows as an indicator.]** *Ehime Kenritsu Eisei Kenkyusho Nenpo (Annu. Rep. Ehime Prefect. Hyg. Lab.)* 37:74; 1975. (Japanese)

Organs from 3 crows (*Corvus coronoides* japonensis) caught in Iyo city in 1976 were analyzed for isomers of BHC, DDT and its metabolites and PCB as well as mercury, lead and cadmium as indices for environmental pollution monitoring. Total BHC levels in pectoral muscle, adipose tissue, brain, liver and kidney averaged 9.32, 29.14, 2.05, 10.71 and 1.17 ppm respectively (fat basis). Total DDT (in the same order) was 15.43, 12.40, 2.45, 20.22, and 3.94 ppm, respectively (fat basis). Compared to the averages for the whole country these values were higher in the muscle, adipose tissue and liver, especially for β-BHC and p,p'-DDE. This is due to the fact that in the western part of Japan the accumulation of BHC and DDT is generally higher. No remarkable findings were obtained for mercury, lead, cadmium, and PCB.

77-1603. Ehime Prefect. Hyg. Lab. (Matsuyama, Ehime, Japan). **[Results of determination of pesticide residues in vegetables and fruits produced in Ehime prefecture.]** *Ehime Kenritsu Eisei Kenkyusho Nenpo (Annu. Rep. Ehime Prefect. Hyg. Lab.)* 37:73; 1975. (Japanese)

Results of determination of pesticide residues (total BHC, total DDT, endrin, dieldrin, dicofol, chlorobenzilate, captan, parathion, malathion, EPN, dimethoate, diazinon, fenitrothion, fenthion, phenthoate and carbaryl) in 35 samples of 13 species of vegetables and fruits (Chinese cabbage, lettuce, strawberry, summer orange peels and pulp, cucumber, tomato, onion, broad beans, tea leaf, watermelon, cabbage, rice and Satsuma orange) produced in Ehime Prefecture in the 1975 fiscal year were reported. It was indicated that although carbaryl in summer orange, dieldrin in cucumber and BHC in tomato sometimes showed amounts close to the established standard (max. tolerance) value, BHC, DDT and carbaryl were not detected or were scarcely detected in other crops, remaining far lower than the standard. Officially, no organophosphorus pesticide residues were detected.

77-1604. Kaniwa, M.; Kojima, S.; Nakamura, A. (Natl. Inst. Hyg. Sci., Tokyo, Japan). **[Elution and volatilization of dieldrin from moth-proofed wool fabrics--an attempt to evaluate the risk of textile treating agents for consumers.]** *Eisei Kagaku (J. Hyg. Chem.)* 23(2): 87-94; 1977. (13 references) (Japanese)

Five kinds of commercial wool fabrics which were found to contain dieldrin and those experimentally treated with dieldrin by soaking or refluxing were examined in view of their risk for human health. Preliminary experiments revealed that the amount of dieldrin eluted by perspiration or saliva increased with increasing total dieldrin concentration in fabrics. The ease of dissolution of dieldrin in both of these human body fluids from the treated fabrics decreased in the order of carpet, blanket, flannel and doeskin. Volatilization of dieldrin obeyed first-order kinetics at 40°C, 50% RH. Factors considered included the treatment conditions, ease of elution and dissolution, and ease of vaporization upon kinetic treatment in terms of total volatilizable dieldrin, dieldrin volatilization rate constant and half life, weight of fabrics and frequency of use of the fabrics. An evaluation of the risk to human health was carried out by comparing the total weighted factors for

each fabrics. It was concluded that the risk increased in the order of tuxedo cloth, doeskin, flannel, blanket, and carpet.

77-1605. Mendola, J. T.; Risebrough, R. W.; Blondel, J. (Serv. Can. Faune, Min. Environ., Ottawa, Ontario, Canada K1A OH3). **Contamination de l'avifaune camarguaise par des residus organochlores. [Contamination of the avian fauna of the Camargue by organochlorine residues.]** *Environ. Pollut.* 13(1): 21-31; 1977. (41 references)

The National Reserve of the Camargue in the Delta of the Rhone is one of the largest nature reserves in Europe, providing a breeding habitat for many species of water birds. Potential sources of pollutant contamination include the waters of the Rhone and the adjacent Mediterranean, irrigation waters entering the Reserve from surrounding agricultural land and the increasing industrial activity immediately to the east. Nevertheless, levels of organochlorine compounds in eggs of several species of birds obtained on the Camargue in 1972 were relatively low in comparison with those recorded in these or related species in northern Europe and North America; adverse effects on the reproduction of fish-eating or raptorial birds of the area have not been found. (Author abstract by permission)

77-1606. Figge, K.; Hoerschelmann, H.; Polzhofer, K. (NATEC-Gesellsch. Naturwiss.-Tech. Dienste mbH, D-2000 Hamburg 50, Germany). **Organochlorpestizide und polychlorierte Biphenyle in Voegeln aus den Gebieten suedliches Suedamerika, Falklandinseln und Norddeutschland. I. Teil. [Organochlorine pesticides and polychlorinated biphenyls in birds from southern South America, Falkland Islands, and northern Germany. Part I.]** *Hospital-Hyg. Gesundheitswes. Disinfekt.* 68(11): 354-360; 1976. (German)

Tissue samples (subcutaneous fat, breast muscle, heart, liver, and brain) from 52 birds from various habitats were subjected to quantitative analysis for levels of twelve organochlorine pesticides and their metabolites, as well as PCB. The North German birds were significantly more heavily contaminated than the corresponding birds from South America. The mean level of total DDT (*p,p'*-DDT and its metabolites) plus PCB in brain tissue from North German birds was 0.21 ppm for marine birds and 2.1 ppm for the average of all other birds. These values were 6.5 and 14 times higher than the corresponding values for South American birds. The distribution of the PCBs was more uniform, regardless of the birds' habitat.

77-1607. Takeda, N. (Dept. Toxicol., Hyogo Prefect. Health Inst., Kobe, Hyogo, Japan). **[Change of pesticide residues in cow's milk and of PCB in fish and shellfish within one year.]** *Hyogo-ken Eisei Kenkyusho Kenkyu Hokoku (Bull. Hyogo Prefect. Publ. Health Inst.)* 11:44-47; 1976. (16 references) (Japanese)

DDT, BHC, and PCB were determined in commercial specimens of cow's milk (DDT plus BHC) and fish and shellfish obtained in Hyogo Prefecture. The value of total DDT averaged 0.001 ppm and that of total BHC (alpha-, beta-, gamma- and delta) averaged 0.010. Compared to the values before the ban on DDT and BHC the residual amounts of both pesticides in cow's milk declined to less than one tenth of the values before the ban. BHC in cow's milk consisted mainly of the alpha- and beta-isomers, indicating the general trend in Japan. It was shown that the ratio of DDE to DDT in cow's milk has increased since the ban in 1973, accounting for more than 80% of the total DDT (*p,p'*-DDT, *o,p'*-DDT, DDE, and DDD).

77-1608. Allahyari, R.; Lee, P. W.; Lin, G. H. Y.; Wing, R. M.; Fukuto, T. R. (Dep. Chem., Univ. Calif., Riverside, CA 92502). **Resolution and reactions of the chiral isomers of *O*-ethyl *S*-phenyl ethylphosphonodithioate (fonofos) and its analogues.** *J. Agric. Food Chem.* 25(3): 471-478; 1977. (33 references)

The chiral isomers of *O*-ethyl ethylphosphonothioic acid, *O*-ethyl *S*-phenyl ethylphosphonodithioate (fonofos), and *O*-ethyl *S*-*p*-bromophenyl ethylphosphonodithioate (*p*-bromo analogue of fonofos) were prepared and their absolute configurations were established by x-ray diffraction analysis and chemical correlation. Also prepared were the chiral isomers of *O*-ethyl *S*-phenyl ethylphosphonothioate (fonofos oxon), *O*-ethyl *S*-*p*-bromophenyl ethylphosphonothioate (*p*-bromo fonofos oxon), phenyl and *p*-bromophenyl ethyl(ethoxy)phosphinyl disulfides. The absolute configurations of the enantiomers of these compounds were assigned by relating them to the configurations of the corresponding *O*-ethyl ethylphosphonothioic acids. Oxidation of (*S*)p-fonofos by *m*-chloroperoxybenzoic acid took place stereoselectively, resulting predominantly in (*R*)p-fonofos oxon and (*R*)p-phenyl ethyl(ethoxy)phosphinyl disulfide. Conversely, (*S*)p-oxon and (*S*)p-disulfide. Oxidation to the oxon proceeded with retention, but oxidation to the disulfide occurred with inversion.

77-1609. Gladstone, C. M.; Wong, J. L. (Dep. Chem., Univ. Louisville, Louisville, KY 40208). **Azadiene chemistry. 4. Insecticidal activities and chemical reactivities of azaaldrin and azadieldrin. Comparison with aldrin and dieldrin.** *J. Agric. Food Chem.* 25(3): 489-493; 1977. (10 references)

This paper relates to azaaldrin (2) and azadieldrin (3) which are bridgehead nitrogen analogues of the once-popular insecticides aldrin (2a) and dieldrin (3a) whose use has been stringently regulated because of the residue problem. The conversion of 2,3,4,5,5-pentachloro-1-azacyclopentadiene (1) and 2 and 3 is shown. The hydrogen-bonding capacity of 2 and 3 was demonstrated by a gas chromatographic technique on a Carbowax 20 M column relative to an SE-30 column. This and the enhanced hydrophilicity of the aza compounds, as measured by their

solubility properties, are the results of the nitrogen lone pair in 2 and 3. Another favorable impact of the bridgehead nitrogen can be seen in the hydrolytic behavior of these chlorinated insecticides in an alkaline medium (homogeneous or heterogeneous) in the presence of visible light at 26°C, e.g., the hydrolysis of 3 proceeds 2.3 times faster than 3a, and 2 is 1.7 times faster than 2a. Both aza compounds, when tested on ten common insect pests and rated against standards such as diazinon, methoxychlor, and methylparathion, have shown some very useful activities. However, the aza compounds are not superior to the carbocyclic analogues in several tests, indicating that the lack of a chlorine atom at the bridgehead may have caused some loss of spatial fit into the neuron sites. Also interesting is the fact that azadieldrin (3) is 12 times less toxic than dieldrin (3a) on dermal application to rats, thus reducing hazard to users and wildlife. (Author abstract reprinted by permission of the American Chemical Society)

77-1610. Rueppel, M. L.; Brightwell, B. B.; Schaefer, J.; Marvel, J. T. (Agric. Res. Dep., Monsanto Agric. Prod. Co., St. Louis, MO 63166). **Metabolism and degradation of glyphosate in soil and water.** *J. Agric. Food Chem.* 25(3): 517-528; 1977. (45 references)

Complete and rapid degradation of glyphosate [*N*-phosphono methylglycine (1)] occurs in soil and/or water microbiologically and not by chemical action. Using soil/water shake flasks, up to 50% of each carbon of 1-^{14}C was evolved as $^{14}CO_2$ in 28 days. In two of the three soils examined, 1 was 90% dissipated in less than 12 weeks. Aminomethylphosphonic acid (2), the only significant soil metabolite of 1, also undergoes rapid degradation in soil. Short-term shake flask metabolism experiments with both ^{13}C- and ^{14}C-labeled 1 were carried out in order to permit facile, unequivocal spectral identification of 1 and its transient metabolite aminomethylphosphonic acid (2). Comparison of the metabolic samples to both reference standards and the spiked controls by means of ^{1}H, ^{31}P, and ^{13}C NMR, mass spectral analysis, ion-exchange chromatography, and thin-layer chromatography has unequivocally characterized both bound and unbound 1 and 2 in soil. The parent herbicide 1 has also been shown to be stable to sunlight, nonleachable in soil, to have a low propensity for runoff, and to have a minimal effect on microflora. (Author abstract reprinted by permission of the American Chemical Society)

77-1611. Rhodes, R. C. (Biochem. Dep., Res. Div., E. I. DuPont de Nemours & Co., Inc., Wilmington, DE 19898). **Studies with manganese [^{14}C]ethylenebis (dithiocarbamate) ([^{14}C]maneb) fungicide and [^{14}C]-ethylenethiourea [^{14}C]ETU) in plants, soil and water.** *J. Agric. Food Chem.* 25(3): 528-533; 1977. (16 references)

Total radiochemical residues on tomato and bean plants decreased rapidly with time following foliar field applications of either [^{14}C]maneb or [^{14}C]ETU (ethylenethiourea). No accumulation or persistence of intact ETU residues was observed from either treatment. In soil treated with [^{14}C]ETU or with [^{14}C]maneb, the half-life of total radiochemical ^{14}C-labeled residues under field conditions was less than 4 weeks for ETU and between 4 and 8 weeks for maneb, whereas the half-life for intact ETU itself was less than 1 week. In plant uptake tests, only trace amounts of total radiochemical residues were taken up by tomato plants grown in field soil treated with [^{14}C]maneb or [^{14}C]ETU. No intact ETU residues were detected in plants from these treatments, and ripe tomatoes from these plants contained no detectable ^{14}C-labeled residues (< 0.01 ppm). In water, glycine was confirmed as the major photodegradation product of [^{14}C]ETU. Ethyleneurea, hydantoin, and Jaffe's base were also identified by mass spectrometry. Overall, these ^{14}C data indicate very little likelihood for the appearance of significant amounts of ETU in the environment or on maneb-treated crops. (Author abstract reprinted by permission of the American Chemical Society)

77-1612. Venkateswarlu, K.; Siddarame Gowda, T. K.; Sethunathan, N. (Lab. Soil Microbiol., Central Rice Res. Inst., Cuttack-753006, Orissa, India). **Persistence and biodegradation of carbofuran in flooded soils.** *J. Agric. Food. Chem.* 25(3): 533-536; 1977. (15 references)

The persistence of carbofuran (2,3-dihydro- 2,2-dimethyl-7- benzofuranyl methylcarbamate) in four soils was studied in the laboratory with special reference to flooded conditions. After thin-layer chromatographic separation of residues, carbofuran in the soil samples was converted to its phenol by alkaline hydrolysis and then assayed colorimetrically following diazotization. More rapid degradation of carbofuran occurred in soils under flooded conditions than under nonflooded conditions. Carbofuran degraded rapidly between 20 and 40 days after flooding in most soils including an acid sulfate saline soil, Pokkali, capable of attaining near neutral pH upon flooding; but the insecticide persisted in another acid sulfate saline soil, Kari, perhaps due to its exceedingly low pH of 4.2, even after several weeks of flooding. Heat treatment of soils prior to incubation increased the persistence of carbofuran under flooded conditions. Moreover, a bacterium, isolated from flooded soil by an enrichment technique, decomposed carbofuran in a mineral salts medium. These studies indicate that microorganisms are involved in the degradation of carbofuran in flooded soils. (Author abstract reprinted by permission of the American Chemical Society)

77-1613. Archer, T. E.; Stokes, J. D.; Bringhurst, R. S. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Fate of carbofuran and its metabolites on strawberries in the environment.** *J. Agric. Food Chem.* 25(3): 536-541; 1977. (9 references)

Three varieties of strawberries, Day-Neutral, Tioga, and Tufts, were sprayed once with carbofuran

(Furadan 4-Flowable) at the rates of (4 and 8 oz of active ingredient)/acre during fruit maturation. The berries and leaves were sampled, and the residues of carbofuran (2,3-dihydro- 2,2-dimethyl-7- benzofuranyl methylcarbamate) and its metabolites were determined. The combined residues on the berries never exceeded the tolerance level of 0.5 ppm, nor did the carbamate fraction exceed 0.2 ppm 6 days after application. In some instances, the amounts of the metabolites 3,7-diol and 3-oxocarbofuran increased until 7 days after application but then decreased in amounts to harvest. Reduction of residues probably resulted from dilution by plant growth and volatilization from the plant tissue surfaces. (Author abstract reprinted by permission of the American Chemical Society)

77-1614. Taylor, A. W.; Glotfelty, D. E.; Turner, B. C.; Silver, R. E.; Freeman, H. P.; Weiss, A. (Agric. Environ. Qual. Inst., Beltsville, MD). **Volatilization of dieldrin and heptachlor residues from field vegetation.** *J. Agric. Food Chem.* 25(3): 542-548; 1977. (22 references)

Dieldrin and heptachlor were applied to a grass pasture at 5.6 kg/ha. Vapor density profiles up to 1 m height were measured up to 23 days after application, and vertical flux intensities were calculated using measured vapor density and wind speed profiles. Dieldrin (650 g/ha) and 2500 g/ha of heptachlor were volatilized from the target area during the first 12 h after application. Volatilization declined rapidly over the first 7 days. Soil and grass analyses confirmed that after 30 days 11% of the applied dieldrin and 4% of athe heptachlor remained in the target area: 6% of the dieldrin and 2% of the heptachlor remained after 15 weeks. Marked diurnal variations in vertical flux intensities of both insecticides were observed during the initial periods of rapid volatilization. (Author abstract reprinted by permission of the American Chemical Society)

77-1615. Turner, B. C.; Glotfelty, D. E.; Taylor, A. W. (Agric. Environ. Qual. Inst., Beltsville, MD 20705). **Photodieldrin formation and volatilization from grass.** *J. Agric. Food Chem.* 25(3): 548-550; 1977. (9 references)

Photodieldrin residues were detected on an orchard-grass pasture within 1 day after application of dieldrin at 5.6 kg/ha. Photodieldrin residues accumulated to a maximum concentration of 51 ppm (85 g/ha) 5 days after the application and then slowly declined to 9 ppm (30 g/ha) after 107 days. Dieldrin residues declined more rapidly and photodieldrin comprised one-third to one-half the total residues after the first 23 days. Vapor flux measurements showed that 2.75 g/ha of photodieldrin volatilized on the third day; this was 1% of the dieldrin volatilization on the same day. About 26 g/ha of photodieldrin was volatilized during the first 3 weeks after application. Later losses were very small. Photodieldrin residues were much less volatile than parent dieldrin. (Author abstract reprinted by permission of the American Chemical Society)

77-1616. Hewsome, W. H.; Iverson, F.; Panopio, L. G.; Herlihy, S. L. (Food Res. Lab., Bur. Chem. Safety, Health Welfare Canada, Tunney's Pasture, Ottawa, K1A OL2, Ontario, Canada). **Residues of dibromochloropropane in root crops grown in fumigated soil.** *J. Agric. Food Chem.* 25(3): 684-685; 1977. (13 references)

Dibromochloropropane (DBCP) was found in radish and carrot crops after application to soil at a rate of 12.26 lb/acre. Residues were highest in carrots (1.5 ppm) and persisted for 16 weeks when applied at seeding. DBCP dissipated from carrot more rapidly than from soil. Foliage of both crops contained smaller amounts of DBCP than the root. Most (78%) of the DBCP in carrot root was contained in the pulp. Approximately two-thirds of the residue in carrot root was removed by boiling. (Author abstract reprinted by permission of the American Chemical Society)

77-1617. Stoller, E. W.; Wax, L. M. (Illinois Agric. Exper. Stn., Urbana, IL 61801). **Persistence and activity of dinitroaniline herbicides in soil.** *J. Environ. Qual.* 6(2): 124-127; 1977. (4 references)

Greenhouse and field studies were conducted to determine the relative activity and persistence in soils of dinitramine (N^4,N^4-diethyl- α,α,α-trifluoro- 3,5-dinitrotoluene- 2,4-diamine), GS 38946 (*N*-ethyl-*N*- tetrahydrofurfuryl- 4-trifluoromethyl- 2,6-dinitroaniline), oryzalin (3,5-dinitro- N^4,N^4-dipropylsulfanilamide), trifluralin (α,α,α-trifluoro- 2,6-dinitro- *N*,*N*-dipropyl-*p*- toluidine), profluralin [*N*-(cyclopropylmethyl)- α,α,α-trifluoro- 2,6-dinitro- *N*-propyl-*p*- toluidine], nitralin [4-(methylsulfonyl)- 2,6-dinitro- *N*,*N*-dipropylaniline], fluchloralin [*N*-(2-chloroethyl)- 2,6-dinitro- *N*-propyl-4-(trifluoromethyl) aniline], benefin (*N*-butyl- *N*-ethyl-α,α,α-trifluoro- 2,6-dinitro- *p*- toludine), chlornidine [*N*,*N*-bis(2-chloroethyl)- 2,6-dinitro- *p*-toluidine], isopropalin (2,6-dinitro- *N*,*N*-dipropylcumidine), butralin [4-(1,1-dimethylethyl)- *N*-(1-methylpropyl)- 2,6-dinitrobenzenamine], and AC 92390 (*N*-*sec*-butyl- 2,6-dinitro-3,4- xylidine). For all plant species tested, dinitramine was most toxic and butralin was least toxic. These herbicides were considered moderately persistent, but dinitramine and butralin were less persistent than the others, a fact which may be of some practical signficance. At normal use rates none of the herbicides showed residual activity to wheat (*Triticum aestivum* L.) planted 5 months after application, or to corn (*Zea mays* L.) planted 12 months after application. (Author abstract by permission)

77-1618. Deuel, L. E., Jr.; Brown, K. W.; Tuener, F. G.; Westfall, D. G.; Price, J. D. (Texas Agric. Exp. Stn., College Station, TX 77843). **Persistence of propanil, DCA, and TCAB in soil and water under flooded rice culture.** *J. Environ. Qual.* 6(2): 127-132; 1977. (14 references)

Field experiments were conducted to determine the residue levels of propanil (3′,4′-dichloropropionanilide), DCA (3,4-dichloroaniline), and TCAB (3,3′,4,4′-tetrachloroazobenzene) in the flood

water and Beaumont clay soil under normal rice (*Oryza sativa* L.) cultivation. Propanil applied as a foliar spray at 3.4 and 6.8 kg/ha 24 hours before flooding was dissipated from the flood water within 24 hours following the flood. The amount of propanil dissipated corresponded to the DCA concentration in the flood water at 24 hours, indicative of biological degradation of propanil to DCA. TCAB was never detected in other than trace quantities. Neither propanil nor its metabolites were detected in soil samples collected at 2.5-5.0 cm and 17.5-20.0 cm below the surface 24 hours following the application of the flood water. (Author abstract by permission)

77-1619. Green, R. E.; Goswami, K. P.; Mukhtar, M.; Young, H. Y. (Dep. Agron. Soil Sci., Univ. Hawaii, Honolulu, HI 96822). **Herbicides from cropped watersheds in stream and estuarine sediments in Hawaii.** *J. Environ. Qual.* 6(2): 145-154; 1977. (34 references)

Analysis of sediments and soils associated with two estuaries on Oahu was conducted to determine if herbicides used in plantation crops reach coastal waters. Analytical procedures were develoepd for simultaneous extraction of atrazine (2-chloro-4- (ethylamino)-6- (isopropylamino)- s-triazine), ametryn (2-(ethylamino)-4-(isopropylamino)- 6-(methylthio)-*s*- triazine), diuron (3-(3,4-dichlorophenyl)- 1,1-dimethylurea), and DCA (3,4-dichloroaniline). Field soil and runoff samples from two small monitored watersheds provided additional information on the dissipation of diuron in sugarcane (*Saccharum officinarum*) and pineapple (*Ananas comosus*) fields, and on diuron removal in runoff waters. Atrazine and ametryn dissipated rapidly in field soils, and neither was found normally in stream and estuarine sediments. Diuron, on the other hand, was sufficiently persistent in soils and sediments to be found in nearly all sediment samples obtained at 6-month intervals at several sites for each estuary and its associated streams. Diuron in sediments was generally < 500 ppb (oven-dry basis), but occasionally much higher concentrations were encountered at sites which were subject to localized contamination from spray equipment loading areas. Diuron appears to be transported in runoff waters principally in the solution phase rather than adsorbed on suspended solids. Estuarine waters (West Loch) contained 0.1 to 1 ppb diuron, while concentrations in runoff waters were several times higher. It is not known if these chronic low levels adversely affect the ecological balance of the estuary. (Author abstract by permission)

77-1620. Asmussen, L. E.; White, A. W., Jr.; Hauser, E. W.; Sheridan, J. M. (U. S. Dep. Agric., PO Box 946, Tifton, GA 31794). **Reduction of 2,4-D load in surface runoff down a grassed waterway.** *J. Environ. Qual.* 6(2): 159-162; 1977. (8 references)

The effectiveness of a grassed waterway in decreasing 2,4-D [(2,4-dichlorophenoxy) acetic acid] content in surface runoff was investigated. Corn (*Zea mays* L.) plots were treated with 2,4-D (0.56 kg/ha) and runoff produced by applying simulated rain was directed through a 24.4-m-long grassed waterway. The 2,4-D concentrations were measured under wet and dry antecedent waterway and plot conditions. Reduction in 2,4-D load in waterways results from water loss by infiltration, sediment loss, and by attachment-absorption on vegetative and organic matter. Of the simulated rainfall applied 1 day after application of 2,4-D, 50% of the water ran off the plots under dry antecedent soil conditions, 78% ran off under wet conditions. Infiltration reduced runoff flowing down the waterway an additional 25% under dry conditions and 2% under wet conditions. Suspended sediment reduction in the waterway was 98 and 94% of the total amount moving from the plot for the dry and wet waterway conditions, respectively. The total loss (on sediment and in solution) of the applied 2,4-D from the plot in the dry and wet states was 2.5 and 10.3%, respectively. (Author abstract by permission)

See also **77-1667** **77-1705** **77-1712** **77-1734** **77-1735** **77-1798**

77-1621. Leistra, M.; Dekkers, W. A. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Some models for the adsorption kinetics of pesticides in soil.** *J. Environ. Sci. Health* B12(2): 85-103; 1977. (12 references)

Three models are discussed which describe adsorption-desorption kinetics of pesticides in soil. These models each could be incorporated into computer programs on pesticide movement in soil. The first model involved single first-order rate equations for adsorption and desorption. Results from an analytical and a numerical solution for local equilibration were compared. Concentration-time relationships for the solution and adsorbed phases were calculated for different rate constants, initial conditions, and partition ratios at equilibrium. The second model described simultaneous adsorption-desorption equilibration with two mechanisms, both with their own rate constants. After a comparatively fast equilibration with the first mechanism, there was a gradual increase in extent of overall adsorption, accompanied by a shift to greater amounts adsorbed by the second mechanism. With the third model, adsorption equilibration occurred by diffusion into a stagnant region. With diffusion distances ranging from 0.1 to 4.0 cm, the time needed for approach to adsorption equilibrium varied from about 0.25 days to about one year. Some of the possibilities of these models were discussed.

77-1622. Wahid, P. A.; Sethunathan, N. (Central Rice Res. Inst., Cuttack-753.006, India). **Relationship between omega values and parathion sorption capacity in soils.** *J. Environ. Sci. Health* B12(2): 147-154; 1977. (5 references)

The relationship between Lambert's omega, an index for active fraction of soil organic matter governing pesticide sorption, and parathion sorption capacity in several Indian soils was studied using C-14-labeled parathion. The results of the study showed that the omega values were considerably affected by soil to solution ratios used in the experiments. Thus omega values derived by Lambert's equation exceeded percent organic matter, especially in soils with low organic matter content, at 1:25 soil to solution ratio. At 1:10 soil to solution ratio, this discrepancy was less pronounced. Based on these, and on other results, it appears that omega values provide, at best, an index for overall adsorption of the insecticide by effective soil mass and not by fraction of organic matter alone. In fact, the importance of soil constituents other than organic matter in the sorption process became increasingly evident when about 50% of the added parathion was sorbed by soils even after destruction of organic matter by treatment with hydrogen peroxide.

77-1623. Young, R. W.; Parr, O. D.; Dickinson, J. K. (Virginia Polytech. Inst. State Univ., Blacksburg, VA). **Residue-removal methods for pesticides and industrial chemicals found in aquatic environments.** *Natl. Tech. Inform. Serv.* PB-250.747, 1975, 24 p.

This research evaluated various methods that have been advanced for separation of polychlorobiphenyls from chlorinated pesticides, to see which were effective in detecting and removing these residues often present in the aquatic environment. Preliminary investigations also were made of a new approach, the silylation of carbamates. Finally, a gas chromatographic (GLC) procedure for chlorophacinone (CPN) was developed by brominating the parent compound. (Author abstract by permission)

77-1624. Kellogg, R. L. (Iowa State Univ., Ames, IA). **Dieldrin contamination of channel catfish, invertebrates and minnows from the Des Moines River.** *Natl. Tech. Inform. Serv.* PB251.046, 1974, 123 p.

The purpose of the study was to define dieldrin exposure to channel catfish and to determine levels of dieldrin contamination in channel catfish from the Des Moines River. Specific objectives were to determine seasonal variations in levels of dieldrin in catfish muscle tissue, to determine dieldrin levels in water and sediment samples from the collection site, to determine dieldrin levels in invertebrate and minnow populations with emphasis on major food organisms of the channel catfish, and to determine empirical relationships between levels of dieldrin exposure and dieldrin residues in catfish muscle tissue. DDT and DDE residues were monitored as well because of the reported interaction of dieldrin and DDT residues on uptake and storage of dieldrin by fish. (Author abstract by permission)

77-1625. Van Hook, R. I.; Huber, E. E. (Oak Ridge Natl. Lab., TN). **National environmental specimen bank survey.** *Natl. Tech. Inform. Serv.* PB-251.180, 1976, 213 p.

The report presents the data base developed in the National Environmental Specimen Bank (NESB) Survey. The NESB Survey mailing list consisted of 4500 names and addresses. The 657 environmental specimen collections that were located and documented in the NESB Survey Data Base include the following categories: animal, atmospheric, geological, microbiological, plant and water. However, the majority of the collections identified are biological in nature. Three indices of the NESB Survey Data Base are included in this report. (Author abstract by permission)

77-1626. Garrett, D.; Maxey, F. P.; Katz, H. (Office of Toxic Substances, Environ. Protect. Ag., Washington, DC). **The impact of intensive application of pesticides and fertilizers on underground water recharge areas which may contribute to drinking water supplies. A preliminary review.** *Natl. Tech. Inform. Serv.* PB-251.181, 1975, 107 p.

A report was submitted on an assessment of the impact of intensive application of pesticides and fertilizers on underground water recharge areas which may contribute to drinking water supplies and also a plan for developing additional information required to define the nature and extent of the impact of agricultural practices on groundwater supplies for public water systems, as re-

quired by the Safe Drinking Water Act (PL-93-523). Both the assessment and the plan were subsumed under the four headings of nitrates, pesticides, economic impacts, and modeling and simulation. Sources of groundwater pollutants were considered with a view towards determining their relative contribution to the overall problems. (Author abstract by permission)

77-1627. Laseter, J. L.; Bartell, C. K.; Laska, A. L.; Holmquist, D. G.; Condie, D. B. (Dep. Biol. Sci., New Orleans, LA). **An ecological study of hexachlorobenzene (HCB).** *Natl. Tech. Inform. Serv.* PB-252,651, 1976, 74 p.

Hexachlorobenzene (HCB) has been found in the environment in southeastern Louisiana in addition to other parts of the world. In this region it is a byproduct of the petrochemical industry. HCB is a fungicide and has been found to accumulate in fatty tissue of wild and domestic animals. It has had toxic effects upon humans. A number of cases of porphyria cutanea tarda were traced to ingestion of treated grain. In this study, soil, water and organism samples were collected periodically in 1974 and 1975 from sites in southeastern Louisiana, with emphasis along the Mississippi River and an industrial region of known contamination by HCB near Geismar, Louisiana. Maximum HCB concentrations in water from the two areas were 90.3 and 74.9 microgram/l (ppb). Maximum HCB concentrations in soil from the two areas were 874 and 53,130 microgram/kg (ppb). Laboratory experiments with the compound included acute toxicity studies in aquatic systems and through injection in fish and crayfish. Accumulation and depuration rates were determined and observations made with histological slides of tissue. (Author abstract by permission)

77-1628. Laseter, J. L.; Bartell, C. K.; Laska, A. L.; Holmquist, D. G.; Condie, D. B. (Dep. Biol. Sci., New Orleans Univ., New Orleans, LA). **An ecological study of hexachlorobutadiene (HCBD).** *Natl. ech. Inform. Serv.* PB-252,671, 1976, 71 p.

Hexachlorobutadiene (HCBD) has been found in the environment in southeastern Louisiana in addition to other parts of the world. In this region it is a byproduct of the petrochemical industry. HCBD has been used as an insecticide in central European orchards and vineyards where excessive contact has caused illness in humans. In this study, soil, water and organism samples were collected periodically in 1974 and 1975 from sites in southeastern Louisiana, with emphasis along the Mississippi River and an industrial region of known contamination by HCBD near Geismar, Louisiana. Maximum HCBD concentrations in water from the two areas were 1.9 and 4.7 microgram/l (ppb). Maximum HCBD concentrations in soil from the two areas were 790 and 1,080 microgram/kg (ppb). Laboratory experiments with the compound included acute toxicity studies in aquatic systems and through injection in fish and crayfish. Accumulation and depuration rates were determined and observations made with histological slides of tissue. (Author abstract by permission)

77-1629. McElroy, A. D.; Chiu, S. Y.; Nebgen, J. W.; Aleti, A.; Bennett, F. W. (Midwest Res. Inst., Kansas City, MO). **Loading functions for assessment of water pollution from nonpoint sources.** *Natl. Tech. Inform. Serv.* PB-253,325, 1976, 468 p.

Methods for evaluating the quantity of water pollutants generated from nonpoint sources including agriculture, silviculture, construction, mining, runoff from urban areas and rural roads, and terrestrial disposal are developed and compiled for use in water quality planning. The loading functions, plus in some instances emission values, permit calculation of nonpoint source pollutants from available data and information. Natural background was considered to be a source and loading functions were presented to estimate natural or background loads of pollutants. Loading functions/values are presented for average conditions, i.e., annual average loads expressed as metric tons/hectare/year (tons/acre/year). Procedures for estimating seasonal or 30-day maximum and minimum loads are also presented. In addition, a wide variety of required data inputs to loading functions, and delineation of sources of additional information are included in the report. The report also presents an evaluation of limitations and constraints of various methodologies which will enable the user to employ the functions realistically. (Author abstract by permission)

77-1630. Irwin, G. A. (Water Resour. Div., Geol. Survey, Menlo Park, GA). **Water-quality investigation, Eel River, CA).** *Natl. Tech. Inform. Serv.* PB-253,744, 1976, 40 p.

The number of samples collected during the special reconnaissance is somewhat limited and therefore the data are only an estimate of conditions that presently exist at selected sites in Eel River. Results indicate that most of the constituents were low in concentration, although some variability was measured for some constituents. Sampling was designed so that samples collected at each site would represent a large range of discharge. Results indicate that discharge was not the singular factor controlling the concentration variance for most constituents. However, the concentrations of total ammonia, phosphorus, arsenic, chromium, copper, and zinc indicated a direct relation with discharge at some sites. Statistical analysis indicates the past sampling program has been adequate to estimate major chemical constituents of the river. (Author abstract by permission)

77-1631. Meiners, A. F.; Mumma, C. E.; Ferguson, T. L.; Kelso, G. L. (Midwest Res. Inst., Kansas City, MO). **Wastewater treatment technology documentation for toxaphene manufacture.** *Natl. Tech. Inform. Serv.* PB-253,676, 1976, 148 p.

The report was prepared to provide technologic supporting information for toxic pollutant effluent standards proposed by EPA under S307(a) of the Federal Water Pollution Control Act Amendments of 1972. The

report identifies potential technologies, assesses implementation feasibility, estimates final effluent characteristics and estimates installation and operation costs for toxaphene manufacturers. (Author abstract by permission)

77-1632. Li, R. T.; Going, J. E.; Spigarelli, J. L. (Midwest Res. Inst., Kansas City, MO). **Sampling and analysis of selected toxic substances. Task 1B. Hexachlorobutadiene.** *Natl. Tech. Inform. Serv.* PB-253,941, 1976, 152 p.

A sampling and analysis program was conducted to determine the extent of environmental contamination by hexachlorobutadiene around nine chemical manufacturers. The plants selected represented six major industries: perchloroethylene, trichloroethylene, carbon tetrachloride, chlorine, triazine herbicides, and pentachloronitrobenzene. Air, water, soil, and sediment samples were collected on and around the plants. In general, higher levels of HCBD in air were associated with production of perchloroethylene and trichloroethylene while the level in the vicinity of chlorine and triazine herbicide plants was very low. No HCBD was found in the air at the pentachloronitrobenzene plant. The highest level of HCBD in air and soil was at a plant using on-site landfill and open pit storage waste-disposal methods. High levels were detected in loading and transfer areas at plants using off-site disposal methods. (Author abstract by permission)

77-1633. Draggan, S. (Oak Ridge Natl. Lab., TN). **Assessment of the microcosm as a tool for estimation of environmental transport of toxic materials.** *Natl. Tech. Inform. Serv.* CONF-750830-2, 1975, 18 p.

Increases in toxic chemical dissipation makes their control in the environment desirable. Environmental control of these substances requires thorough understanding of the functioning of ecosystems potentially receiving chemical input, and of the behavior and fate of released chemicals. Terrestrial microcosms are useful tools in chemical fate studies; however, critical assessment of their ability to simulate ecosystem processes has been limited. This paper provides a rationale for evaluating the utility of microcosms for prediction of chemical fate in natural ecosystems. (Author abstract by permission)

77-1634. Kasai, A.; Asanuma, N.; Suzuki, A. (Jap. Inst. Rural Med. Usuda, Nagano, Japan). [**Studies on organochlorine pesticide residues in human body III.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(4): 629; 1976. (Japanese)

The results of determination of BHCs, dieldrin, and DDT and its metabolites in tissue specimens from 60 human patients were reported. On the average, adipose tissue contained 0.089 ppm of alpha-, 2.517 ppm of beta- and 0.040 ppm of gamma-BHC, respectively (total BHC: 2.659 ppm). Adipose tissue also contained 1.357 ppm of *p,p'*-DDT, 4.415 ppm of *p,p'*-DDE, and 0.060 ppm of *o,p'*-DDT (total DDT:5.929 ppm). The dieldrin content was 0.129 ppm. No sex difference was found except for *p,p'*-DDE, which was higher in men. No significant difference in residues was seen between farmers and non-farmers. According to pathological anatomic findings in 15 cadavers DDT residues were present in decreasing order in the subcutaneous fat, mesentery, liver, and kidney. Residues of dieldrin in subcutaneous fat and mesentery were low. Within 3 years, the residues in adipose tissue decreased for beta-BHC, total BHC, and *p,p'*-DDT; however, *p,p'*-DDE and total DDT amounts were greater in 1972 than in 1971. Gamma-BHC and dieldrin showed a peak in 1972.

77-1635. Nakamura, S.; Asanuma, N.; Suzuki, A. (Japan Inst. Rural Med., Usuda, Nagano, Japan). [**Mercury content of human hair.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(4): 648; 1976. (Japanese)

Human hair samples collected in Nagano Prefecture from 57 persons of both sexes not engaging in agriculture and from 50 persons engaging in agriculture were analyzed for mercury and methyl mercury. The highest total Hg was 10.68 ppm in a non-farming man, and the lowest total Hg was 0.68 ppm in a farming woman; average Hg contents were 482, 3.30, 3.05, and 1.64 ppm, respectively, in non-farming men, farming men, non-farming women, and farming women. The ratio of methyl mercury to total mercury was 0.64, 0.53, 0.59 and 0.52 in non-farming men, farming men, non-farming women, and farming women, respectively. When these values were compared to those found during the period before the ban on mercury pesticides, the recent values were seen to be reduced to one-half or one third in people engaged in agriculture. This fact seems to suggest disappearance of direct effects of the pesticide. The results on non-farming people showed no differences from those obtained a few years ago.

77-1636. Yamada, T.; Mitsukuni, Y.; Noda, Y.; Sugiyama, S.; Yoshimura, M. (Fac. of Med., Kinki Univ., Japan). [**Pesticide residues in human body III. BHC.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 30(3): 247; 1976. (Japanese)

The amount of residual BHC in subcutaneous fat of 126 cadavers and in liver of 62 cadavers, in both cases autopsied after sudden death, within one year beginning in April 1974 in Osaka Prefecture was shown. According to separate data for isomers of alpha-, beta-, gamma- and delta-, BHC 98-99% of the BHC was beta, with a small amount of gamma and smaller amount of alpha in both subcutaneous fat and liver: the beta-content showed an increase with age as 4.150, 4.862, 8.374 and 7.378 ppm in subcutaneous fat in people of ages 0, 1-19, 20-49 and older than 50. No sex related difference was found in total BHC in subcutaneous fat from 59 cases and in liver from 30 cases. BHC contents in both tissues were higher in newborns than in older babies. The delta isomer was generally not detected.

77-1637. Yamada. T.; Sugiyama. S.; Noda. Y.; Mitsukuni. Y.; Yoshimura. M. (Fac. of Med.. Kinki Univ.. Osaka. Japan). [**Pesticide residues in human body IV. DDT.**] *Nippon Hoigaku Zasshi (Jap. J. Legal Med.)* 30(3): 247-248; 1976. (Japanese)

DDT residues were determined in the same cadavers as in Part III (*Pesticides Abstracts* No. 77-1636). About 75% of the total DDT in subcutaneous fat and 60% in liver consisted of DDE; DDD was not detected in subcutaneous fat of adults. The total DDT to DDE ratio increased with age. i.e.. 1.63/1.283. 2.21/1.663. 4.71/3.92. and 4.44/3.639 (ppm) in subcutaneous fat. and 2.06/1.109. 3.26/1.811. 4.30/2.722. and 6.44/4.391 (ppm) in liver (fat base) in the age ranges of 0. 1-19. 20-49. and older than 50. Residues of total DDT. DDT and DDE in subcutaneous tissue of adults were 3 times greater and those in liver of adults were 2 - 3 times larger than in infants.

77-1638. Yoshimura. M.; Yamada. T.; Sugiyama. S.; Noda. Y.; Mitsukuni. Y. (Fac. Med.. Kinki Univ. Osaka. Japan). [**Pesticide residues in human body V. Total amounts of organochlorine pesticide residues.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 30(3): 247; 1976. (Japanese)

Total residual amounts of total BHC. total DDT. dieldrin. and total organochlorine pesticides (ppm. fat basis) were surveyed in subcutaneous fat from 126 cases and in liver from 62 cases obtained from forensic autopsies during one year beginning April 1974 in Osaka Prefecture. The amounts of dieldrin and heptachlor epoxide increased with age in both subcutaneous fat and liver. as did those of BHC. DDT. and total organochlorine pesticide. Residues in adults were about 2 times as large as those in infants. It was noticed that residues of dieldrin and heptachlor epoxide in adipose tissue of newborns were larger than those in the same tissues of older infants. The ratios of BHC/DDT and of BHC/total organochlorine pesticide in adipose tissue became lower with age. but BHC/total organochlorine pesticides became higher with age. The actual amounts of BHC. DDT. dieldrin. heptachlor epoxide. and total organochlorine pesticide in adipose tissue from victims aged 1-19 years vs. 20-49 years were 4.95/8.45. 2.2/4.71. 0.065/0.080. 0.038/0.049 and 7.26/13.27 ppm.

77-1639. Aizawa. T.; Takase. I.; Kawasaki. T.; Matsuura. K.; Fujishita. A.; Matsubara. I. (Residue Lab.. Inst. Nihon Tokushu Noyaku Seizo Co.. Ltd.. Tokyo. Japan). [**Effects on the environment of disyston and fensulfothion applied to soil for controlling *Bursaphelenchus lignicolus.***] *Noyaku Kenkyu (Pestic. Study)* 23(3): 14-21; 1977. (3 references) (Japanese)

The results of a two-year survey on movement of pesticides in soil. leaching into subterranean water. and absorption and accumulation in marsh crabs and wild plants are presented. The pesticides. 5% granular ethyl thiometon and 3% granular diethyl 4-methylsulfinylphenyl- phosphorothionate (fensulfothion). were applied to soil for controlling *Bursaphelenchus lignicolus*. After applying the respective insecticide formulations at 3 kg per tree to *Pinus densiflora* the soil and irrigation water were collected at intervals and analyzed for the pesticide. No pesticide residue was detected. and no translocation of the pesticide in soil was detected 2-5 m away from the application site in level forest terrain. At 4 or 5 months after applying the respective insecticide formulations at 1.5 and 3.0 kg per tree to the pines in a mountain forest. only traces of ethylthiometon were detected in marsh water and soil nearby; however. after one year no pesticide was detected. In marsh crabs. chestnuts. *Petasites japonicus* and bracken collected in the pesticide-treated forest. no residue of ethylthiometon and fensulfothion was detected. also showing no accumulation.

77-1640. Anonymous. **Insecticides in breast milk.** *Nutr. Rev.* 35(4): 72-73; 1977. (5 references)

The persistence of insecticides in human breast milk five or more years after exposure to these chemicals had ceased was investigated. Fifty samples of breast milk were collected from women living mainly in the Oslo region of Norway who were not normally subject to insecticide exposure. All samples contained hexachlorobenzene. one or more forms of benzene hexachloride (BHC). DDT. and its metabolite DDE. Other insecticides such as heptachlor epoxide. aldrin. and dieldrin were discovered in some samples. Thirty-six samples contained DDT at a concentration above the maximum safe level recommended by the World Health Organization for cow's milk. The same was true for benzene hexachloride in 28 samples and hexachlorobenzene in seven. These findings suggest that the total daily intake of DDT was greater than the maximum permitted by WHO in 46 of the 50 samples. Benzene hexachloride and DDT levels were higher in the colostrum and fell progressively up to the fourth month when sampling stopped.

77-1641. Ishida. T.; Imanaka. M.; Ogino. Y.; Matsunaga. K.; Kasai. K.; Ueno. S.; Kawahara. H. (Sect. Environ. Health. Div. Health. Okayama Prefectural Office. Okayama. Japan). [**Residues of seven kinds of organophosphorus pesticides in vegetables.**] *Okayama-Ken Eisei Kenkyusho Nenpo (Annu. Res. Okayama Pref. Hyg. Lab.)* 23: 145; 1976. (2 references) (Japanese)

Seven kinds of organophosphorus pesticide residues (parathion. malathion. EPN. dichlorvos. dimethoate. diazinon. and fenitrothion) in vegetable samples produced in Okayama Prefecture were determined by Fukuhara's method with a gas chromatograph. The recovery of fortified pesticides was in the range of 80-95% for the seven pesticides. The result of determination on fruits of eggplant. potato. Japanese radish (leaf and root. respectively). watermelon. cucumber. grape. sweet potato. cabbage. and broad beans showed that only diazinon was detected in cabbage at 0.062 ppm. The numbers of samples were small (one or two each).

77-1642. Kearney, P. C.; Isensee, A. R.; Kontson, A. (Agr. Environ. Quality Inst., ARS, USDA, Beltsville, MD 20705). **Distribution and degradation of dinitroaniline herbicides in an aquatic ecosystem.** *Pestic. Biochem. Physiol.* 7(3): 242-248; 1977. (13 references)

A study was made to measure the distribution, accumulation, and degradation of six dinitroaniline herbicides from soil and bound soil residues and from direct, repeated applications to water in an aquatic ecosystem. The herbicides examined included butralin, chlornidine, dinitramine, fluchloralin, profluralin, and trifluralin. The final concentrations in water (30-day) were: fluchloralin, 14.8; chlornidine, 13.4; butralin, 12.2; dinitramine, 10.5; trifluralin, 7.5; and profluralin, 5.7 ppb. It is noted that dinitramine inhibited algae growth. Extensive dinitroaniline degradation in ecosystems was strongly suggested. Photosensitivity studies showed that photoalteration of these herbicides may be extensive at certain shallow depths when they first enter the aquatic environment. Under natural sunlight the herbicides should be expected to degrade to more polar products. Further study suggested that the polar nature of the products released from the bound state poses less of a potential for biomagnification than do the parent herbicides. Direct repeated applications of profluralin (without soil) at 4-day intervals resulted in a rapid increase, than a decrease in bioaccumulation ratios for *Gambusia*, but a continuous increase for catfish.

77-1643. Yamamura, Y.; Yamauchi, H. (Sch. Pub. Health, Faculty Med., St. Marianna Univ., Kawasaki, Kanagawa, Japan). [**Arsenic in biological samples of workers exposed to arsenic trioxide.**] *Sangyo Igaku (Jpn. J. Industrial Health)* 18(2): 530-531; 1976. (8 references) (Japanese)

Arsenic contents in hair from the head and the armpit and in blood of eight workers in a factory (producing arsenic acid as a wood preservative) where arsenious acid is oxidized were determined, as was the excretion of arsenic in their urine. The content of As in the factory air was 0.015 and 0.03 mg/m^3 (by personal sampler). The average As contents of the individual workers' scalp hair were 26, 27, 29, 42, 65, 124, 171, and 348 ppm. The As content of their axillar hair was 99, 116, 54, 60, and 116 and 235 ppm as compared to the control value of 0.26 ppm (average of 19 persons). The arsenic content of the worker's blood was, on the average, 3.3 μ/100 g as compared to control values of 0.7 μg/100 g. The average arsenic content of the workers' urine was 169 (44-501) μg/l, compared to 78 (6-389) μg/l in control urine. It was also found that after ingestion of seafoods the arsenic contents of the urine increased rapidly, and after stopping ingestion of seafoods the content decreased. The high As content of the workers' hair was attributed to airborne arsenious acid dust in the working site.

77-1644. Sugano, T.; Osawa, T.; Takahashi, K.; Konishi, T.; Mishima, Y.; Kato, T. (Sendai Municipal Hyg. Lab. Sendai, Miyagi, Japan). [**Pesticide residues in foods and soils.**] *Sendai Municipal Hygiene Lab. Official Report* 5: 143-152; 1977. (3 references) (Japanese)

One hundred samples of vegetables (13 kinds) and fruits (7 kinds) collected in Miyagi Prefecture were analyzed for BHC, DDT and its metabolites (*p,p'*- and *o,p'*-DDT, DDD, and DDE), polychlorocyclodienes, dicofol, and chlorobenzilate in 1973 and 1974. Residues of BHC were hardly detected except for 0.005 and 0.009 ppm in cabbage and spinach in 1973 (0.006 ppm was detected in carrot, for which no standard is established). DDT was also rarely detected except for 0.007 ppm in apple in 1974. Residues of dieldrin were detected in potato, cucumber, and strawberry at levels of 0.017, 0.029 and 0.048 ppm in 1973, and at 0.005 ppm in cucumber in 1974, values which exceeded the standard: residues of endrin were detected in strawberry at a maximum of 0.007 ppm, which exceeds the standard. Sixty-six soil samples collected from upland fields in the suburbs of Sendai were analyzed for pesticide residues as above in 1973 and 1974. All the soil samples contained such pesticide residues as those mentioned above, and especially high levels rate of dieldrin (0.46-nd, except for one abnormal value of 4.1 ppm).

77-1645. Kondo, H.; Oguro, M.; Tahara, I.; Watari, H. (Tokushima Prefectural Environ. Protect. Center, Tokushima, Tokushima, Japan). [**Effects on environmental water quality in the vicinity of an area where pesticides had been applied from airplane for controlling *Monochamus alternatus*.**] *Shikoku Koshu Eisei Gakkai Zasshi (J. Shikoku Public Health Soc.)* 22(1): 22-24; 1977. (Japanese)

The recent phenomenon of pine tree withering has been attributed to viruses carried by *Monochamus alternatus*, and fenitrothion is to be applied aviochemically on a broad scale. Studies were performed to estimate the effects of fenitrothion on the environmental water quality in rivers, sea water, and fish breeding ponds near Anan city, Shikoku. Application of fenitrothion was carried out twice at 1.8 kg/ha and 1.5 kg/ha. Following the first treatment water was sampled at one hr and 3 days after application, and following the second treatment sampling was done at 0.5, 1, and 5 hr and 1 and 3 days after application. The highest concentration of fenitrothion in the sample was 0.265 ppm 5 hr after the second application, and other values were far lower than this and showed rapid decreases. Especially in fish breeding ponds no fenitrothion was detected. According to the experimental results fenitrothion was very stable in the pH range of 4-9; when irradated by UV rays its degradation was more rapid in alkaline media than in acidic media. The relatively rapid diminution of fenitrothion in seawater would depend upon these conditions.

77-1646. Takeshita, T. (Shimane Prefect. Hyg. Environ. Pollut. Lab., Matsue, Shimane, Japan). [**Heavy metal content of crow's feathers and organochlorine compound content of their internal organs.**] *Shimane-Ken Eisei Kogai*

Kenkyusho Kenkyu Nenpo (Annu. Rep. Shimane Prefect. Hyg. Environ. Pollut. Lab.) 17: 38-39; 1975. (Japanese)

The results of determination of heavy metals (Hg. Pb. and Cd) in feathers and of organochlorine compounds such as PCB. alpha- and beta-BHC. DDT. DDE. and DDD in internal organs of crows (*Corvus corone interpositas*. 7 specimens and *C. coronoides japonensis*. 3 specimens) were reported. The average amounts of Hg. Pb. and Cd in the feathers was 2.1. 11.1. and 0. 39 ppm. respectively. showing no great differences from those throughout the entire country. averaging 2.5. 19.3. and 0.52 ppm. Levels of BHC in pectoral muscle. adipose tissue. brain. liver and kidney averaged 1.3 (beta:0.97). 1.11 (0.80). 1.52 (1.25). 1.66 (1.38) and 0.61 (0.49) ppm. also not showing any great difference from the average for the whole country of 2.7. 3.4. 0.9. 2.7 and 1.0. Residues of total DDT were. in the same order. 4.16. 4.81. 2.75. 3.40. and 1.10 ppm. showing no great difference from the whole country average. It was noteworthy that there were great individual differences in the content of the substances determined and there were some significant correlations between Hg and PCB and DDT and PCB and DDT. It was thus concluded that because of the large intragroup difference of pollutant contents the results could not be directly used for environmental monitoring.

77-1647. Bucholtz. D. L.; Lavy. T. L. (Dep. Agron.. Univ. Nebraska. Lincoln. NB). **Effects of ^{60}Co radiation on herbicides in aqueous solution.** *Weed Sci.* 25(3): 200-202; 1977. (13 references)

Phytotoxicity of herbicides in water was measured before and after exposure to gamma radiation from a ^{60}Co irradiator. Chromatographic methods and bioassays were used to measure alterations that occurred during ^{60}Co exposure. Phytotoxicity of picloram (4-amino-3.5.6-trichloropicolinic acid and trifluralin ($\alpha.\alpha.\alpha$-trifluoro-2.6-dinitro- *N.N*- dipropyl-*p*-toluidine) solutions was reduced even with the lowest dose of ^{60}Co. 1.7-megarad (Mrad). Alterations in phytotoxicity of atrazine (2-chloro-4-ethylamino -6- isopropylamino -*s*- triazine) and dicamba (3.6-dichloro -*o*- anisic acid) solution occurred only at 5 Mrad. which was the highest dose used. The phytotoxicity of atrazine solutions increased with the 5-Mrad irradiation. Thin layer chromatography (TLC) data showed that all herbicides were altered by ^{60}Co irradiation. Several products resulted when trifluralin was irradiated.

77-1648. Zimdahl. R. L.; Gwynn. S. M. (Weed Res. Lab.. Colorado State Univ.. Fort Collins. CO 80523). **Soil degradation of three dinitroanilines.** *Weed Sci.* 25(3): 247-251; 1977. (18 references)

These studies were conducted in the laboratory on two soils at two temperatures to define the rate of degradation and the associated rate laws for trifluralin ($\alpha.\alpha.\alpha$-trifluoro-2.6- dinitro-*N.N*- dipropyl-*p*-toluidine). benefin (*N*-butyl-*N*- ethyl-$\alpha.\alpha.\alpha$- trifluoro-2.6- dinitro -*p*- toluidine). and 2.6-dinitro- *N*-(3-pentyl)- $\alpha.\alpha.\alpha$-trifluoro-*p*-toluidine (hereafter referred to as Unnamed). Rate of degradation was directly correlated with temperature and moisture content. First order kinetics adequately described the rate of degradation at 15° C. but the simple first order assumption was not sufficient to describe degradation at 30° C. The implication of our interpretation is that at 30° C two rate processes may operate in the soil degradation of these three dinitroaniline herbicides. The data show an initial rapid first order rate of degradation with a subsequent change to a slower first order process. First half lives ranged from 0.4 to 1.8 months at 30° C and were consistently lower in a loam than in a sandy loam soil.

77-1649. Sasaki. S.; Miura. A.; Yoshida. H.; Sasaki. S.; Takahashi. K.; Konno. M.; Sasaki. K.; Takahashi. M.; Umishio. K.; Izumi. S. (District Health Activ. Div.. Yuri Coop. Gen. Hosp. Yuri. Akita. Japan). [**Results of a survey on pesticide intoxication in Honjo and Yuri districts.**] *Akita-Ken Noson Igakkai Zasshi (J. Akita Prefect. Rural Med. Assoc.)* 23(1): 57; 1976. (Japanese)

According to the results of a questionnaire sent to 1952 individuals engaging in agriculture in the Honjo and Yuri districts. there were 312 cases of apparent pesticide intoxication. The percentage of cases with imperfect protective clothing was 38.1. The percentage of people who continued to work during their illness was 56.5%. The percentage of persons who did not consult a doctor during their illness was 75.4%. In spite of the predominant use of the so-called low toxicity pesticides. many farmers were observed with skin damage probably due to pesticides. especially in July.

77-1650. Taylor. J. S.; Wuthrich. R. C.; Lloyd. K. M.; Poland. A. (Dept. Dermatol.. Cleveland Clin. Foundation. Cleveland. OH). **Chloracne from manufacture of a new herbicide.** *Arch. Dermatol.* 113(5): 616-619; 1977. (20 references)

This report describes the first cases of chloracne from 3.4.3'.4'-tetrachloroazoxybenzene (TCAB). an extraneous intermediate formed during the manufacture of the herbicide. 2-(3.4-dichlorophenyl)- 4-methyl-1.2.4-oxadiazolidine- 3.5-dione. Workers in a small chemical company first noted the development of bumps one to two months after herbicide production began. When the company was visited several months later. more than 90% of the workers had chloracne. There was no evidence of significant hepatotoxicity or porphyria during the short time the herbicide was produced. TCAB does produce an acnegenic effect when applied to the rabbit ear. and is also a potent inducer of the microsomal enzyme aryl hydrocarbon hydroxylase. Prevention of chloracne is a difficult industrial engineering task and treatment of the disease is very difficult.

77-1651. Cope. I.; Robert. O. (Royal Hosp. Women. Paddington. Sydney. Australia). **Bowen's disease of the**

vulva -- its possible relationship to exposure to arsenic. *Aust. N. Z. J. Obstet. Gynaecol.* 16(4): 235-237; 1976. (5 references)

A case of Bowen's disease occurring in a 29-year-old woman is presented because it illustrates some unusual features of the condition and raises again the question of its possible relation to arsenic exposure. The patient's history included arsenic exposure when, as a child, she lived in Northern New South Wales where she used to help with the packing of bananas. It is suggested that sitting on packing cases contaminated with arsenic or handling bananas sprayed with arsenic may have led to the development of Bowen's disease of the vulva. The patient's history also included reference to having had a carcinoma-in-situ of the cervix treated by total hysterectomy 6 years earlier. At that time post-surgical vaginal cytology had been normal. Management in this case will consist of conservative excision following by repeated examinations using toluidine blue staining of the vulva or ^{32}P vulval scanning.

77-1652. Zinkl, J. G.; Henny, C. J.; DeWeese, L. R. (U. S. Fish Wildlife Serv., Denver Wildlife Res. Cent., Bldg. 16, Federal Cent., Denver, CO 80225). **Brain cholinesterase activities of birds from forests sprayed with trichlorfon (Dylox) and carbaryl (Sevin-4-oil).** *Bull. Environ. Contam. Toxicol.* 17(4): 379-386; 1977. (11 references)

Brain cholinesterase activities were determined in birds from forests sprayed with Dylox (trichlorfon) at 1.13 hg/ha (1 lb/acre a.i.) or Sevin-4-oil (carbaryl) at 1.13 kg/ha (1 lb/acre a.i.). Birds were collected before, during, and up to 5 days after spraying. Of 10 species evaluated from the Dylox spray area, four species represented by six individuals had brain cholinesterase values which were depressed more than two standard deviations below the mean. Three of these individuals (two species) had activites that were about 20% less than the mean. Of the 12 species evaluated from the Sevin-4-oil spraying, three individuals representing three species had depressed cholinesterase values. One value was depressed more than 20% below the mean. Half of the depressed activities were found in canopy-dwelling birds collected on the day of spraying. It is concluded that spraying of the forests with Dylox and Sevin-4-oil resulted in only minimal pesticide exposure to the birds inhabiting the areas.

77-1653. Sandhu, S. S. (Water Lab., South Carolina State Coll., Orangeburg, SC 29117). **Study on the post-mortem identification of pollutants in the fish killed by water pollution: detection of arsenic.** *Bull. Environ. Contam. Toxicol.* 17(3): 373-378; 1977. (11 references)

Careless aerial spraying of a field with arsenical herbicides for weed control and defoliation of cotton before machine picking resulted in the contamination of an adjoining reservoir, killing large numbers of fish. Three dead catfish (*Ictalurus punctatus*), samples of reservoir water, and cocklebur (Amarantha) leaves were analyzed using an atomic absorption spectrophotometer. All samples contained relatively high arsenic concentrations, indicating that arsenic was probably responsible for the fish killing. The fish that escaped lethal injury continued to accumulate arsenic; the arsenic level in the fish continued to increase with time although the arsenic level in the water decreased with time. Over a period of 7 wk after the initial herbicide application, the ratio of arsenic in fish and pond water increased to 6.5:1.

77-1654. Dhahir, H. I. (Baghdad, Iraq). **Forensic aspects of methylmercury poisoning in iraq.** *Forensic Sci.* 5(2): 121; 1975.

In 1972 one of the largest outbreaks of poisoning by a mercurial compound in the history of man occurred. The tragedy occurred in Iraq and caused about 6,530 persons to be admitted to hospitals throughout the country with a fatality record of 459. Various methods were used to identify and determine mercury content in foodstuffs and biological materials. Chemical methods, atomic absorption spectrophotometry, neutron activation analysis and gas chromatography were used. Total, organic and inorganic mercury were determined in the tissues of the deceased subjects. Symptoms of poisoning were mostly neurological and fatalities resulted from apparent failure of the central nervous system. Ingestion of home-made bread prepared from wheat treated with methyl mercury was the main route of administration in this outbreak.

77-1655. Sato, C. (Naka-Ku, Yokohama, Kanagawa, Japan). [**On the hypothesis that organophosphorus compounds cause myopia.**] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 71(2): 175-176; 1977. (12 references) (Japanese)

Opinions are presented to refute the hypothesis of Ishikawa et al., who declared that organophosphorus pesticides caused acquired myopia. The experimental findings of myopia and direct astigmatism without elongation of the ocular axis observed in their beagles were due to long term oral administration of an organophosphorus pesticide at a very high level which would never be given to humans. The suspected human cases of myopia were said to be remedied by atropine; however, this is often true of myopia in younger persons. The statistical results showing a correlation between organophosphorus pesticides and myopia seem to make too drastic an assumption regarding causality. The suppositions that myopia is more frequent in rural districts than in cities, that prewar myopia differed from the cases seen after the war, and they toxic and fundus damage is more common than acquired myopia were not substantiated at all. According to these findings, organophosphorus poisoning does not seem to be the major cause or a strongly possible cause.

77-1656. Utsumi, T.; Miyata, M. (Sch. Ophthalmol., Osaka Med. Coll., Osaka, Japan). [**Biochemical studies on**

a case of degenerative pigmentosa retinae suspected to be due to chronic intoxication by organophosphorus pesticides.] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 71(5): 550-555; 1977. (16 references) (Japanese)

A male patient was examined for irritation and redness of the left eye. The patient, age 53, had experienced contact with dichlorvos and other organophosphorus pesticides for 15 years. Observed symptoms comprised retinal pigment degeneration with residual ERG waves. A therapeutic trial was carried out with administration of pralidoxime and vitamin A, and examination of lipoprotein fractions was carried out. The ERG, dark adaptation, and visual acuity were closely correlated with changes in true cholinesterase. Vitamin A has a relationship to metabolism in the epithelium of the internal ear; vitamin A deficiency causes tinnitus and dizziness, both of which normalize upon administration of vitamin A. Vitamin A is also strongly related to dark adaptation and changes in the ophthalmic fundus. Because of the high pre-beta value in the lipoprotein fraction, resembling that seen in cases of hereditary retinal pigment degeneration, the existence of a background of hereditary retinal pigment degeneration was supposed. Because high dichlorvos residues were found in the patient's blood (0.023 ppm) the authors concluded that it is probable that the hereditary degeneration was aggravated by dichlorvos.

77-1657. Shiozaki, H.; Kuwahara, R.; Tsujita, E.; Tanaka, A.; Kihira, Y.; Inoue, S.; Takasaki, H. (Tsu Nat. Hosp. Tsu, Mie Prefect., Japan). [**Two cases of autopsies victims of acute intoxication by organophphorus pesticides, EPN and dichlorvos.**] *Iryo (Med. Treatment)* 31(2): 161-163; 1977. (8 references) (Japanese)

A 46-year-old farmer was hospitalized after being found in generalized convulsions with loss of consciousness and foam escaping from mouth and nose; moderate mydriasis were seen, then the heart beat and respiration stopped. Emergency treatment restored his heart beat; however, respiration was not restored, and he died after one hr. Following a detailed autopsy, the gastrointestinal contents (500 ml of suspension) were gas-chromatographed to detect EPN, which was decided to be the cause of death. The second case involved a 42-year-old farmer hospitalized by a doctor who diagnosed hypnotic intoxication. Mydriasis in both eyes and a large amount of foam in the oral cavity were found. Under suspicion of organophosphorus intoxication, gastric lavage was carried out with administration of large amounts of atropine and pralidoxime; the patient died after 7 hr. After precise autopsy with blood examination, the gastric content was gas-chromatographed and revealed dichlorvos. These two cases were at first very difficult to diagnose because of incomplete mydriasis (in case 1) and the long duration of sleep.

77-1658. Conde-Salazar, L. (Serv. Dermatol., Inst. Nac. Med. Segur. Trabajo, Madrid, Spain). **Nuestra experiencia en dermatosis profesionales agricolas.** [**Occupational dermatoses in agriculture.**] *Med. Segur. Trabajo* 23(91): 27-33; 1975. (Spanish)

Occupational dermatoses caused in Spanish agricultural workers by various environmental factors were surveyed in a communication presented at the 6th International Congress of Agricultural Medicine (Cambridge, 1975). The chemical factors (pesticides) appear to act by a process of sensitization or toxic effects, or both. Among insecticides of vegetable origin the pyrethrin oils extracted from the genus *Chrysanthemum* have strong sensitizing action and cause contact dermatoses on exposed areas (hands, arms and face). Synthetic insecticides, such as DDT or BHC (lindane), could cause sensitization or photosensitization. The herbicides, especially quaternary ammonium derivatives or pentachlorophenol derivatives have, in rare cases, caused sensitization. Pesticides from the dithiocarbamate group, such as zineb, maneb and thiram also have sensitizing effects. Arsenical pesticides cause various chronic dermatoses i.e., palmar and plantar hyperkeratosis, melanoderma, and multiple epithelioma. This communication also reports dermatoses caused by meteorological factors, contact with animals or plants, and other chemical factors such as gasoline, gas oil, and other oils used in the operation of agricultural machinery.

77-1659. Horiguchi, Y.; Yanagisawa, T.; Ide, H.; Sasaki, K. (Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Studies on the effects of organophosphorus pesticides on the human central nervous system.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(4): 627-628; 1976. (Japanese)

Neurological examinations, mainly EEG recordings, were carried out before and after pesticides application on farmers who had engaged in pesticides application for many years, and the results were compared with those in 2 acute cases of intoxication. In one case of acute intoxication, disturbances of consciousness and spasmodic episodes appeared, and after 10 days, slow alpha waves of 8 c/s and slow waves were seen in the EEG. One acute case without disturbance of consciousness showed no change in the EEG; however, reductions of serum and erythrocyte ChE activity were noted. The results of EEG examinations on the farmers showed that before application 12 out of 20 farmers indicated a more than moderate rate of slow alpha waves at 8-9 c/s despite absence of neurological findings, and some aggravations of the EEG were indicated after application.

77-1660. Kambe, Y.; Ide, T.; Takeshige, M. (Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Investigation on allergy due to pesticides by patch test II.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(4): 628-629; 1976. (Japanese)

Patch tests were carried out on 41 farmers from 3 villages using all the pesticides they applied and on 10 control non-farmers. Of 19 cases with a history of contact

dermatitis. 13 cases showed positive reactions; of 8 cases with a history of acute intoxication. 2 cases showed positive reactions; and of 14 cases without symptoms. 7 cases showed positive reactions. In non-farmers. 3 cases of positive reactions were seen. The pesticides which gave positive reactions were 50% dichlorvos EC. fenitrothion. cyanox. surecide. vinyphate. diazinon. phenthoate. leptophos. chlorothalonil. PCNB. maneb. zineb. trifluralin. copper 8-quinolinol. cartap. tokusan. streptomycin. captafol. methomyl. and sclex. Of them. 50% dichlorvos EC and chlorothalonil showed positive responses in 25 and 56% of the cases. respectively. indicating that they are pesticides with skin irritating ability. The response of both groups (with and without a history of pesticides intoxication) seemed to be the same in percentage of positivity.

77-1661. Nagata. H.; Izumiyama. T.; Kamata. K.; Takano. S.; Kobayashi. S.; Yamagishi. M.; Suzuki. K. (Hokushin Gen. Hosp.. Nagano. Nagano. Japan). [**Health survey on the operators of speed sprayers for pesticide application in fruit tree cultivation zone. General conclusions on a recent 3-years survey.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(4): 629-630; 1976. (Japanese)

The results of a health survey on 72 operators of speed sprayers for pesticide application in apple orchards during 1970-1972 were compared to those obtained during 1965-1967. when the use of parathion prevailed. The general findings in 1970-1972 were 63.8-72.2% normal condition. 13.0-24.2% slightly abnormal. 1.6-9.3% requiring detailed examination. and 5.6-10.3% requiring treatment. The diseases requiring treatment were high blood pressure. stomach ulcer. chronic gastritis. and anemia. The examination data which showed abnormalities were hemoglobin. RBC. WBC. serum ChE activity. GPT. GOT and alkaline phosphatase activities. The values of alkaline phosphatase were abnormal in all examinations. and could be clearly divided into high. moderate. and normal value groups. The number of operators with reduced serum ChE activity became far lower than that when parathion prevailed. It is debatable whether this finding was due to the wide use of low-acute-toxicity organophosphorus pesticides.

77-1662. Khamdamov. Kh. A. (Uzbek Sci. Res. Inst. Sanit. Hyg. Occup. Dis.. USSR). **Tonograficheskie pokazateli glaz u detei, podvergavshikhsia vozdeistyiiu pestitsidov v usloviiakh sel'skoi mestnosti nekotorykh rainov Uzbekistana.** [**Tonographic examinations of the eye in children exposed to effects of pesticides applied agriculturally in some areas of Uzbekistan.**] *Oftalmol. Zh.* 31(3): 226; 1976. (Russian)

Results of tonometric examinations of the eyes of 5-14-yr-old children living within a radius of 1 km from fields intensely treated with pesticides are presented. Compared with a control group from areas where no pesticides are used. the exposed children showed significant increases in intraocular pressure. in humor production. and in Becker's coefficient and a reduction of the coefficient of discharge of the intraocular fluid.

77-1663. Takemoto. K.; Katayama. H.; Kawai. H. (Sch. Pub. Health. Tokyo Med. Dent. Univ.. Tokyo. Japan). [**A doubtful case of arsenic induced lung cancer.**] *Proc. Annu. Meet. Jpn. Assoc. Indust. Health* 50: 386-387; 1977. (Japanese)

A 60-year-old man who was engaged in charging. heating. and stirring arsenic nitrate wearing only a cloth mask from 1946 to 1958 in a pesticide factory showed acute dermatitis after 3 months' work and dermatopapilloma-like symptoms 23 years after the initial exposure. The diagnosis in 1963 was Bowen's disease with a typical epithelial proliferation suggesting a precancerous state. The present disease was found by the cytological diagnosis of sputum as He was diagnosed as having epithelioma in the right upper lung lobe by bronchoscopic scraping. The content of arsenic in healthy alveoli was 1.02 μg/g dry tissue as compared to 0.38 μ/g/g dry tissue in control alveoli. The patient is a heavy smoker. and the effects of this should not be neglected in the causation of his lung cancer. However. his occupational history and dermal Bowen's disease as well as the high content of arsenic in the lungs indicates high exposure to arsenic. fully suspicious of causing the lung cancer.

77-1664. Akoboshi. S.; Takahashi. M.; Seki. K.; Kameda. S.; Tashiro. M.; Harada. A. (Minihara Gen. Hosp.. Osaka. Japan). [**A case of acute phosphine toxicosis with chronic course.**] *Proc. Annu. Meet. Jpn. Assoc. Indust. Health* 50: 285-259; 1977. (Japanese)

A case of phosphine intoxication following long term handling of pesticides in a warehouse was reported. A 53 year old man. after one day of exposure to phosphine used for disinfection of a warehouse. experienced headache. nausea. feeling of pressure the chest. and swelling of extremities. The symptoms became aggravated. and progressed to deforming cervical spondylosis. liver impairment. and dermatitis. He was again exposed to phosphine during fumigation. and the same symptoms appeared. After hospitalization. the diagnosis was dermatitis. slight impairment of liver function. and deforming cervical spondylosis. Despite treatment with vitamins. numbness of the fingers remained and liver impairment continued. According to hepatic biopsy. the active phase of chronic hepatitis was confirmed.

77-1665. Ushio. K.; Osotsuka. R. (Health Inspect. Ctr.. Tokyo Rosai Hosp.. Tokyo. Japan). [**A severe case of methyl bromide intoxicaton.**] *Proc. Annu. Meet. Jpn. Assoc. Ind. Health* 50: 260-261; 1977. (Japanese)

A case of severe intoxication due to occupational exposure to methyl bromide for fumigation was reported. After engaging in fumigation with methyl bromide since Nov. 1975. a 41 year old man showed changes in character

with gait instability. After performing heavy work on Feb. 16, 1976, in a fumigated warehouse for 8 hrs., he showed general convulsions, urinary incontinence and coma, then was hospitalized. Despite transient high fever, heavy sweating, pulmonary emphysema, chemical pneumonia, and respiratory arrest for 24 hr, he recovered from the pulmonary symptoms after 12 days in hospital. His convulsions could not be controlled but the interval between episodes became greater with time. Even after 20 days in hospital he showed loss of consciousness, without response to stimulation. It took him 4 wweeks to regain consciousness. Now, after 11 months, he is unable to care for himself due to tremors of intent.

77-1666. Japan Plant Protect. Soc. (Tokyo, Japan). **[On the officially established standards of good practice for application of dithiocarbamate fungicides.]** *Shokubutsu Boeki (Plant Protect.)* 31(3): 128-131; 1977. (Japanese)

In Japan an agricultural pesticide is registered with officially established standards of good practice for application consisting of the crops to be protected, pests to be controlled, dilution ratio of the pesticide formulation, the last date of application, total times and methods of application. Standards of this type for zineb, maneb, mancozeb, and bis(dimethyl carbamoyl) zinc ethylenebis(dithiocarbamate) (polycarbate) were introduced in 4 tables for countrywide recognition. It is noteworthy that some crops on which these dithiocarbamates had formerly been allowed are deleted now; they are wheat, barley, rye, oats, tea, and hops (for zineb); cucumis species, tomato, strawberry, Welsh onion, onion, beans, Chinese cabbage, wheat, barley, rye, oat, maize, and beet (for maneb); rice plant, greenhouse grown eggplant, strawberry, and hops (for mancozeb); and strawberry (for polycarbate). These deletions were the result of reconsideration of residue and toxicological data during registration. The specific reasons for deletion were not given.

77-1667. Anonymous. **[Lists of food additives and pesticide residue standards in crops with specification for cow's milk and dairy products as of Jan. 1977.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn).* 18(1): 98-125; 1977. (Japanese)

The standards (maximum tolerance concentration) for pesticide residues were presented in a table. The designated pesticides are bromine, arsenic and its compounds as As_2O_3, lead and its compounds as Pb, total sum of alpha-, beta-, gamma- and delta-BHC, captafol, captan, chlorobenzilate, dicofol, DDT including DDD and DDE, dieldrin including aldrin, endrin, total chlorfenvinphos, diazinon, dichlorvos, dimethoate, EPN, fenitrothion, fenthion, phenthoate, malathion, parathion, carbaryl, and tricyclohexyltin hydroxide. The crops designated are rice, wheat, buckwheat, maize, adzuki bean, soybean, garden pea, broad bean, strawberry, cherry, persimmon, watermelon, pear, summer orange, loquat, grape, cucumis species, Satsuma orange, peach, apple, tea, cow's milk, and 31 kinds of vegetables. In several cases, standards for several pesticides have not yet been established on some crops; for instance, a residue standard for tricyclohexyltin hydroxide of less than 2.0 ppm was established only on Japanese pear and apple.

77-1668. Kusakabe, K.; Oguri, M. (Sch. Pediatr., Fac. Med., Gumma Univ., Maebashi, Gumma, Japan). **[A case of acute organophosphorus pesticide intoxication in an infant.]** *Shonika Shinryo (Pediat.)* 40(6): 683-687; 1977. (9 references) (Japapese)

A female baby aged 1-5/12 years suddenly showed clouding of consciousness and vomiting, and her mother noticed an empty bottle of organophosphorus insecticide nearby. Before emergency hospitalization she was given gastric lavage and intravenous pralidoxime. She smelled strongly of parathion and had a very low serum ChE activity of 0.2 Δ pH with recurrent miosis despite intravenous drop infusion of PAM, totaling 1.1 g, and increased clouding of consciousness advancing to coma. After combining intravenous injection of 0.5 mg atropine sulfate with PAM miosis gradually disappeared, and after a slight aggravation probably due to trichloreel (a hypnotic used for EEG examination) she was almost recovered after about 26 days (serum ChE of 0.9 Δ pH). The total amounts of pralidoxime and atropine sulfate given were 2.6 g and 0.8 mg, respectively. During the severest condition she did not show dyspnea, pulmonary edema, convulsions, muscular fasciulations, pyrexia, sweating, and salivation, but did not show miosis. In addition her mother, attending her bed, showed symptoms of vomiting and headache, probably due to transfer of pesticide from her baby.

77-1669. Ghassemi, M.; Quinlivan, S. (TRW Systems Group, Redondo Beach, CA). **A study of selected landfills designed as pesticide disposal sites.** *Natl. Tech. Inform. Serv.* PB-250,717, 1975, 143 p.

This report presents the results of an in-depth study of historical, environmental, political, social, economic, and institutional aspects of selected landfills used for the disposal of pesticide waste. Information from the ten sites studied incidate that while there are similarities in certain features of the establishment and operation of some of the sites, the landfills also differ in a number of respects. The similarities and differences reflect the similarities and differences between applicable state regulations, local waste disposal needs, and cost factors. At the present time in many areas of the country there is a great need for the establishment of pesticides disposal sites or the development of alternative disposal methods. This report which presents the results is intended to serve as an information transfer publication, making available to pesticide disposal site planners and other interested parties the experience gained at the operating sites. (Author abstract by permission)

77-1670. Program Eval. Div. (Environ. Protect. Ag., Washington, DC). **Development of a contingency plan for certification of pesticide applicators.** *Natl. Tech. Inform. Serv.* PB-250,718, 1975, 25 p.

This report is based on a request to determine when a plan of action should be prepared for EPA to follow if applicators of restricted use pesticides cannot be certified before the legislative deadline of 1976. (Author abstract by permission)

77-1671. Off. Planning and Manage. (Environ. Protect. Agr., Washington, DC). **Protection from ineffective pesticides.** *Natl. Tech. Inform. Serv.* PB-250,770, 1975, 48 p.

The review examines the policies, procedures and performance of the Agency in keeping ineffective products from being formulated, marketed or used. Because of their toxic characteristics, most pesticides pose some threat to man or to the environment. The goal of EPA regulation of pesticides is to ensure that the benefits provided by use outweigh the negative effects. For this reason the Agency is concerned with efficacy, the degree to which a pesticide product is capable of providing beneficial results. (Author abstract by permission)

77-1672. McNamara, B. P. (Edgewood Arsenal, Aberdeen Proving Ground, MD). **Oximes as antodotes in poisoning by anticholinesterase compounds.** *Natl. Tech. Inform. Serv.* AD-A023,243, 1976, 124 p.

A number of oximes have been used or proposed for use in poisoning produced by anticholinesterase compounds. This paper discusses some of these oximes as to (1) physical and chemical properties, (2) biochemical mechanism of action in poisoning, (3) effectiveness of oximes in poisoning, (4) pharmacological effects of oximes, and (5) toxicological effects of oximes. (Author abstract by permission)

77-1673. Ferguson, T. L; Bergman, F. J.; Cooper, G. R.; Li, R. T.; Honea, F. I. (Midwest Res. Inst., Kansas City, MO). **Determination of incinerator operating conditions necessary for safe disposal of pesticide.** *Natl. Tech. Inform. Serv.* PB-251,131, 1975, 415 p.

This research program was initiated with the overall objective of determining design and operational criteria for incinerators that can effect complete thermal degradation of pesticides. An experimental incineration system was designed and constructed to evaluate the effect of operational variables (rate of pesticide injection, percent excess air, operating temperature, and retention time) on the efficiency with which organic pesticides can be incinerated (45.4 kg/hr (100 lb/hr) Type 1 waste capacity), a three-stage scrubber, and a scrubber water treatment system. Nine pesticides in 15 liquid and solid formulation were tested by injection into the primary combustion chamber. The pesticides studies studied were DDT, aldrin, picloram, malathion, toxaphene, atrazine, captan, zineb, and mirex. Results of the incineration test were evaluated in terms of the efficiency of active ingredient destruction, i.e., the percent of the pesticide destroyed. A set of operating conditions (temperature, retention time, and excess air rate) was developed from comparable results for all 15 formulations which is believed to be applicable to the incineration of all organic pesticides. (Author abstract by permission)

77-1674. Gruber, G. I. (TRW Systems Group, Redondo Beach, CA). **Assessment of industrial hazardous waste practices: organic chemicals, pesticides, and explosives industries.** *Natl. Tech. Inform. Serv.* PB-251,307, 1975, 377 p.

The objectives of this study were to determine, for the manufacturers of industrial organic chemicals, pesticide preparations and formulations and explosives: (1) the quantities and geographic distributions of land-destined hazardous wastes, (3) commercial control technology which could be applied to reduce the hazards presented by disposal of such wastes, and (4) the cost of present practices and the applicable commercial technology. (Author abstract by permission)

77-1675. Shih, C. C.; Dal Porto, D. F. (TRW Systems Group, Redondo Beach, CA). **Handbook for pesticide disposal by common chemical methods.** *Natl. Tech. Inform. Serv.* PB-252,864, 1975, 103 p.

This study is concerned with utilizing chemical degradation/detoxification methods for the disposal of small quantities of pesticides wastes. A primary objective of the study is to develop procedures to advise pesticide users of safe, readily available chemical methods for pesticide disposal. Another objective is to delineate the hazards associated with pesticide disposal by chemical methods, and warn the layman against the indiscriminate use of chemical disposal methods based on incomplete knowledge of the degradation products or the hazardous nature of the detoxifying reagents. Chemical degradation information on twenty different pesticides, representing each of the major pesticide classes, is discussed. Chemical degradation procedures that can be used by the layman are described for naled, diazinon, Guthion, azinphosmethyl malathion, carbaryl, captan, and atrazine, but not for chlorpyrifos, methyl parathion, maneb, alachlor (Lasso), diuron, picloram, trifluralin, methoxychlor, chlordane, toxaphene, 2,4-D, amiben-(chloramben), and pentachlorophenol. (Author abstract by permission)

77-1676. Quinlivan, S.; Ghassemi, M.; Santy, M. (TRW Systems Group, Redondo Beach, CA). **Survey of methods used to control wastes containing hexachlorobenzene.** *Natl. Tech. Inform. Serv.* PB-253-051, 1976, 92 p.

This study presents the results of a survey of methods used to control wastes containing hexachlorobenzene (HCB). The specific objectives were to identify

the sources and characteristics of manufacturing wastes containing HCB, to document methods used for treatment and disposal of HCB wastes, and to evaluate the environmental adequacy of the treatment and disposal methods. (Author abstract by permission)

77-1677. Leedy, D. L. (Urban Wildl. Res. Ctr. Inc., EEllicott City, MD). **Highway-wildlife relationships. Volume 1. A state-of-the-art report.** *Natl. Tech. Inform. Serv.* PB-253-421, 1975, 193 p.

The study assesses, primarily through an extensive literature review, what is known about highway-wildlife relationships and suggests research and management approaches to protect and enhance fish, wildlife, and environmental quality. The 20 million or more acres in highway rights-of-way have been largely neglected as wildlife habitat. Opportunities exist for creating valuable fish and wildlife impoundments during construction, yet the minimal effort needed to locate and design such impoundments has generally not been made. The Nation's four million miles of streets and highway often create 'edges' conducive to wildlife. Many millions of wild vertebrates are killed annually, but apparently most wildlife populations are not seriously affected by such losses. Highway construction through limited ranges of endangered species can be a serious problem, as can erosion, wetland drainage, stream alteration, structures which block the passage of anadromous fish, and pollutants resulting from highway maintenance and use. Better measures for mitigating habitat losses, predicting effects of highways on fish and wildlife, reducing animal-vehicle accidents, and enhancing highway environment for fish, wildlife, and people are sorely needed. (Author abstract by permission)

77-1678. Whitmore, F. C. (Versar Inc., Springfield, VA). **A study of pesticide disposal in a sewage sludge incinerator.** *Natl. Tech. Inform. Serv.* PB-253,485, 1975, 193 p.

The objective of this contract was to demonstrate that a modern sewage sludge incinerator with the appropriate pollution control equipment could be used to safely destroy typical organic pesticides. Accordingly, DDT and 2,4,5-T were mixed with sewage sludge and burned first in a pilot scale multiple hearth furnace and then in a full scale municipal sewage sludge incinerator. Destruction efficiencies were 99.97 percent or higher for DDT and 99.99 percent or higher for 2,4,5-T. The major conclusion is that DDT and 2,4,5-T can be safely destroyed by coincineration with sewage sludge in a multiple hearth furnace. (Author abstract by permission)

77-1679. Off. Water Planning Stds. (Environ. Protect. Ag., Washington, DC). **Criteria document for toxaphene.** *Natl. Tech. Inform. Serv.* PB-253,677, 1976, 3 p.

The document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of toxaphene, with emphasis on aquatic behavior. From these data a criterion for the protection of aquatic life and human health is developed. (Author abstract by permission)

77-1680. Wastler, T. A.; Offutt, C. K.; Fitzsimmons, C. K.; Des Rosiers, P. E., (Maritime Admin., Washington, DC). **Maritime administration chemical waste incinerator ship project. Volume 2. Disposal of organochlorine wastes by incineration at sea.** *Natl. Tech. Inform. Serv.* PB-253,979, 1975, 224 p.

The first officially sanctioned incident of ocean incineration in the United States occurred aboard the M/T Vulcanus in the Gulf of Mexico from October 1974 through January 1975 under an ocean dumping permit issued by the U.S. Environmental Protection Agency under the authority of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended to the Shell Chemical Company in Deer Park, Texas, for ocean incineration of organochlorine wastes. The report describes the monitoring activities undertaken to evaluate ocean incineration as a disposal method. A total of 16,800 metric tons of waste were incinerated at a maximum rate of 25 metric tons per hour with a 1200OC minimum and a 1350OC average flame temperature. Stack gas emissions were mentioned for plume dispersion characteristics and to determine combustion efficiency. The findings indicate that more than 99.9 percent of the wastes were oxidized. Marine monitoring surveys indicate that there were no measurable increases in concentrations of trace metals and organochlorides in the water and marine life. (Author abstract by permission)

77-1681. Manuel, K. L.; Bender, E. S.; Pearson, J. G. (Edgewood Arsenal, Aberdeen Proving Ground, MD). **Results of aquatic surveys at Pine Bluff Arsenal, Arkansas, September 1973- October 1974** *Natl. Tech. Inform. Serv.* AD-A024,382, 1976, 55 p.

Biological surveys of the streams of Pine Bluff Arsenal (PBA) were conducted from July 1973 through October 1974. Each stream was sampled monthly at two stations, one above the bluff line and one below the bluff line. Species diversity in the streams was adversely affected by runoff and scouring at the sampling stations in the upper stream. An analysis of macroinvertebrate collections and water chemistry data gathered during the water-quality monitoring program conducted at PBA permitted an evaluation of the quality of the water in each drainage area. (Author abstract by permission)

77-1682. Schlatter, I. (Schweiz. Toxicol. Inform. Cent., Zurich, Switzerland). **Vergiftungen mit dem Unkrautvertilgungsmittel Paraquat. [Paraquat poisoning.]** *Schweiz. Rundsch. Med.* 65(27): 837-842; 1976. (19 references) (German)

Paraquat has been widely applied within the past ten years; when safely applied it presents little risk to

humans or animals. However, accidental (or intentional) ingestion of small quantities of paraquat has resulted in more than 200 deaths since 1966. The proximate cause of death in most cases was progressive pulmonary fibrosis, resulting in death within 1-3 wk. Eleven cases of oral intoxication by paraquat were reported to the Swiss Toxicology Information Center in 1966-1975; six of the patients died. The case histories of these patients are reported. The five surviving patients did not show any signs of lung damage. Treatment included immediate gastric lavage, repeated administration of adsorbents such as Fuller's Earth or bentonite and laxatives, as well as early hemodialysis. Oxygen administration may be necessary but should be delayed as long as possible. Nitrogen has also been used to reduce alveolar oxygen pressure. Other treatments tried have include superoxide dismutase, D-propranolol, steroids, immunosuppressants, and alkylating agents. Additional safety measures are recommended for paraquat sale.

77-1683. Vialatte, J.; Paupe, J.; Housset, M. F. (Hop. Enfants Malades, Paris, France). **530 Intoxications d'enfants a l'Hopital des Enfants Malades. [530 Childhood poisoning cases at the Children's Hospital of Paris.]** *Sem. Hop.* 24(4): 263-271; 1977. (22 references) (French)

A study of accidental and intentional poisonings at the Hopital des Enfants Malades in Paris revealed 530 cases admitted between August 1971 and August 1972 in children less than 16 years of age. Findings were similar to those from previous studies. There was a slight predominance of males among the poisoning cases, and a maximum frequency was seen between the ages of 18 months and 3 years. A peak frequency occurred in terms of time of day between 4 and 8 ppm. Causative substances were mainly drugs (52.8%) and household products (36.2%). Children from large families were most often affected. The delay before arrival in hospital was less than 1 hr in 140 cases. Pesticide poisoning accounted for 11 of the reported cases. There were no deaths.

77-1684. Lubran, M. M. (UCLA Sch. Med., Dept. Pathol., Harbor General Hosp., Campus, Torrance, CA). **Measurement of enzymes in environmental intoxications.** *Ann. Clin. Lab. Sci.* 7(3): 210-215; 1977. (43 references)

This paper details the enzymes which have been shown to be affected by certain xenobiotics, i.e., certain foreign substance found in man's environment. Considered as xenobiotics are industrial pollutants, toxic metals, toxic gases and food additives. Large scale treatment of agricultural areas with herbicides and pesticides created health hazards for farm workers and consumers of farm products. Insecticides may persist in the environment and be consumed by humans. Xenobiotics or their metabolites may accumulate in the body without producing detectable effects until a critical level is reached. It thus becomes important to distinguish between body burden and toxic concentrations of these chemicals. The role of mixed function oxidases is discussed and methods of assessing their activities are indicated.

77-1685. Helm, U. K. (Pharmakol. Inst. der Rheinischen Freidrich Wilhelms Univ., Bonn, Germany). **[Zum Frage der Textilschaedlingsbekaempfung in Textillagern mit einem Kombinationspraparat aus Methoxychlor und Chlorpyrifos. [*O,O*-Diethyl- (3,5,6-trichlor-2-pyridyl)-monothiophosphat.] Textile pest control in textile warehouses with a combination of methoxychlor and chlorpyrifos.** *Arzneim. Forsch.* 27(I)(3): 538-542; 1977. (15 references) (German)

The effects of a mixture of methoxychlor and *O,O*-diethyl- (3,5,6-trichloro- 2-pyridyl)- monothiophosphate (chlorpyrifos) used in pest control in the textile industry were studied in humans under realistic conditions. The chemicals are used in poorly ventilated textile storage areas. Chronic exposure of the subjects to chlorpyrifos resulted in a 40% inhibition of the serum cholinesterase (ChE) without any significant spontaneous recovery of the ChE activity in three out of four subjects during the test period. The acetylcholinesterase activity of the erythrocytes (AChE), however, while experiencing a temporary decrease initially, was considerably increased for the duration of the test. These results led to the suggestion that pesticides containing alkyl phosphates not be used for textile pest control in poorly ventilated rooms if human exposure during the desorption phase is possible.

77-1686. Schober, U.; Lampert, W. (Limnological Inst., Univ. Freiburg, Konstanz-Egg, Germany). **Effects of sublethal concentrations of the herbicide atrazine on growth and reproduction of *Daphnia pulex*.** *Bull. Environ. Contam. Toxicol.* 17(3): 269-277; 1977. (7 references)

Over periods of 28-70 days, cultures of *Daphnia pulex* were transferred every other day to fresh medium made up of a sterile filtered lake water solution containing ^{14}C-labeled atrazine (1-20 mg/liter) and a definite amount of food. The herbicide significantly inhibited the production of young, expressed either as production per individual or as total young production in the population; the effect was evident at 1 ppm atrazine. Growth was reduced with increasing atrazine concentrations, the greatest reduction (53.7%) occurring between 1 and 5 mg atrazine/liter. Atrazine up to 10 ppm had no significant effect on longevity, the high mortality observed at 1 ppm being due to some other unknown factor. An influence of the herbicide on longevity under starvation conditions also could not be proved. The effects of atrazine were increased when the herbicide was combined with 0.5% ethanol; the effect was synergistic. The data indicate that the determination of the acute toxicity of a substance allows only a rough estimation of its actual poisoning effect.

77-1687. Shannon, L. R. (11 Sci. Hall 11, Iowa State Univ., Ames, IA 50011). **Equilibrium between uptake and elimination of dieldrin by channel catfish, *Ictalurus punctatus*.** *Bull. Environ. Contam. Toxicol.* 17(3): 278-284; 1977. (10 references)

Channel catfish (*Ictalurus punctatus*) measuring approximately 150 mm in length were exposed continuously to 13-49 pptr dieldrin over periods of up 70 days. The dieldrin was mixed with nonlethal concentrations of acetone (25 ppm) and Triton X-100 (1 ppm). Dorsal muscle samples from the fish were analyzed using electron capture gas chromatography. Fish exposed to 13 pptr dieldrin accumulated a mean of 29 ppb dieldrin in the dorsal muscle after 56 days and 31 ppb at the end of the 70-day test. Fish exposed to 27 pptr accumulated a mean of 39 ppb dieldrin after 56 days and 48 ppb after 70 days of exposure. In neither the 13 or 27 pptr groups was the difference between the muscle dieldrin levels at 56 and 70 days significant. Fish exposed to 49 pptr dieldrin continued to accumulate the pesticide linearly throughout the exposure period; after 70 days, the dieldrin concentration in this group was significantly higher (164 ppb) than after 56 days (130 ppb). The data indicate that a balance between uptake and elimination of pesticide was reached in less time at lower exposure levels than at higher levels.

77-1688. Pachecka, J.; Krolewska, B. (Dep. Drug Metabolism, Inst. Biopharm., Med. Acad. Warsaw, Poland). **The effects of dichlorvos and trichlorphon on catalase induction, respiration and growth of yeast, (*Saccharomyces cerevisiae*.)** *Bull. Environ. Contam. Toxicol.* 17(3): 342-348; 1977. (12 references)

Aerobic and anaerobic yeast (*Saccharomyces cerevisiae*) cultures were treated with dichlorvos or trichlorfon (0-1.00 mg/ml). Dichlorvos but not trichlorfon had an inhibitory effect on catalase induction in yeast adapting to aerobic atmosphere. Dichlorvos at concentrations of 0.1-1.0 mg/ml also caused a marked decrease in oxygen uptake in the presence of glucose or ethanol. Trichlorfon had no effect on respiration of yeast at the concentrations tested. Dichlorvos at 1 mg/ml completely inhibited the growth of standard strain Yeast Foam on a glycerol containing medium but had no effect on the

growth of a cytoplasmic respiratory deficient mutant. Trichlorfon had no effect on the growth of either strain in any medium. Dichlorvos had no cytotoxic action on yeast cells. The data suggest that dichlorvos disturbs the oxidative process in yeast cells. Yeast may be a particularly suitable organism for screening studies of the effects of environmental contaminants on a number of biochemical processes.

77-1689. Jordan, M.; Rzehak, K.; Maryanska, A. (Inst. Systematic Exp. Zool., Dep. Exp. Zool., Polish Acad. Sci., Cracow, Poland). **The effect of two pesticides, Miedzian 50 and Gesagard 50, on the development of tadpoles of *Rana temporaria*.** *Bull. Environ. Contam. Toxicol.* 17(3): 349-354; 1977. (10 references)

Tadpoles of the frog *Rana temporaria* in two developmental stages were treated with aqueous suspensions of Miedzian 50 (basic cupric chloride) and Gesagard 50 (prometryne, Primaze). The 0.01% and 0.05% suspensions of Miedzian caused a partial cytolysis in the cells of the intestinal epithelium and liver parenchyma. Gesgard was more toxic than Miedzian, producing degenerative changes in the alimentary canal and brain. It also produced developmental disorders, such as a partial inhibition of growth and retardation in the process of completion of the operculum. Younger tadpoles were more resistant to both pesticides than were older tadpoles, possibly because the sensitivity of the central nervous system increases with increasing differentiation. For agricultural application, Miedzian 50 and Gesagard 50 are used in concentrations up to 15%.

77-1690. Bursian, S. J.; Edens, F. W. (Dep. Poultry Sci., North Carolina State Univ., Raleigh, NC 27607). **The prolonged exposure of Japanese quail to carbaryl and its effects on growth and reproductive parameters.** *Bull. Environ. Contam. Toxicol.* 17(3): 360-368; 1977. (19 references)

Random bred Japanese quail (*Coturnix coturnix japonica*) were maintained from the day of hatching through 14 wk of age on a diet containing 0-1200 mg/kg technical grade carbaryl. Chicks resulting from the mating of these birds were placed on the same carbaryl diet as their parents. After 14 wk, carbaryl at levels of 900 and 1200 ppm decreased body weights and increased relative liver weights, and at 150-1200 ppm significantly increased kidney weights. Over a 6 wk period, carbaryl produced no significant difference in any of these growth parameters in the chicks of the carbaryl-fed parents. Among the parents, there were no significant differences in egg production, hatchability, or fertility among the control and carbaryl-fed birds, although trends toward reduction of these parameters were developing at the 900 and 1200 ppm levels. With regard to the effects of carbaryl on growth, it appears that the time of exposure is critical and that parental diet is not.

77-1691. Foster, M. G.; McQueen, D. J. (Dep. Biol., York Univ., Toronto, Canada). **Multiple applications of benomyl and effects on non-target soil fungi.** *Bull. Environ. Contam. Toxicol.* 17(4): 468-476; 1977. (15 references)

Clay-loam soil plots sown with winter wheat were treated with Benlate (benomyl) once every 7 days at a rate of 1 g/m^2. Bacterial populations in both the treated and control (water-treated) plots stabilized within about 7 days after the first treatment, and during the remainder of the experiment, the number of bacterial isolates from the treated soil remained at about 30-50% of the number isolated from the control soil. After 12 wk, isolations from the treated soil were significantly below those from the control soil. The benomyl treatments had no significant inhibitory effect on the *Mucor* or *Rhizopus* species, whereas *Penicillium*, *Trichoderma*, and *Fusarium* species were significantly inhibited by the fungicide. Fusarium showed the greatest sensitivity to benomyl. The data indicate that multiple applications of benomyl do not result in progressive decreases in total bacterial counts, but that they do prevent a return to control levels. Furthermore, different bacteria generally are affected differently by the fungicide.

77-1692. Foster, M. G.; McQueen, D. J. (Dep. Biol., York Univ., Toronto, Canada). **The effects of single and multiple application of benomyl on non-target soil bacteria.** *Bull. Environ. Contam. Toxicol.* 17(4): 477-484; 1977. (9 references)

Benomyl was applied at a rate of 0.5-1.0 g/m^2 to plots of soil in the field. In one experiment, the pesticide was applied only once, and in other experiments, it was applied every 7 days for 11 or 12 weeks. At 0.5 g/m^2, benomyl reduced soil bacterial populations after single and multiple applications. However, the number of bacteria isolated from the experimental plots generally returned to control levels within 4-5 wk. The reduction in bacterial populations was significantly greater after the 1.0 g/m^2 applications than after the 0.5 g/m^2 applications, and the bacterial numbers did not return to control levels within the experimental period. Perfusion experiments in the laboratory indicated that Benlate affects the rate of soil nitrification when incorporated into the soil at 0.1-10.0 ppm. These data support previous results which suggested that benomyl affects the nitrifying bacteria in soil in a manner not yet established.

77-1693. Thompson, N. P.; Courtney, C. H.; Forrester, D. J.; White, F. H. (Food Sci. Dep., Univ. Florida, Gainesville, FL 32611). **Starvation-pesticide interactions in juvenile brown pelicans.** *Bull. Environ. Contam. Toxicol.* 17(4): 485-490; 1977. (12 references)

Ten-week-old wild brown pelicans (*Pelecanus occidentalis*) were inoculated with 3 x 10^8 cells of *Edwardsiella tarda* and were deprived of food for 1-2 wk beginning 8 days after inoculation. Samples of brain, liver, muscle, and fat were analyzed for chlorinated hydrocarbons using electron capture gas chromatography. A control group of fed birds lost an overage of 66 g/bird over the course of the experiment, whereas the starved birds lost an

average of 906 g/bird. After 1 and 2 wk of starvation, the *p,p'*-DDE concentration in the fat was significantly higher than in the fed controls. The *p,p'*-DDE concentration in the brain was also significantly higher in the starved group after 2 wk than in the fed group. The other tissues showed no consistently significant differences between the fed and starved birds. Residues of *p,p'*-DDD and *p,p'*-DDT were less than those of *p,p'*-DDE but showed similar concentration patterns in the various tissues. The data indicate that during starvation, DDE residues are increased on a ppm basis.

77-1694. Hutson, D. H. (Shell Toxicol. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent, England). **Some observations on the chemical and stereochemical specificity of the de-alkylation of organophosphorus esters by a hepatic glutathione transferase.** *Chem. Biol. Interact.* 16(3): 315-323; 1977. (18 references)

The chemical and stereochemical specificity of the dealkylation of organophosphorus esters by a hepatic gluathione transferase was studied. Hepatic glutathione (GSH) *S*-methyl transferase from rabbit, pig, and dog demethylated dimethyl phosphate triesters. No stereospecificity towards racemic ethyl methyl 2-chloro-1- (2,4-dichlorophenyl) vinyl phosphate could be demonstrated, but the enzyme exhibited some selectivity towards the (and (-) forms of *O*-methyl *S*-methyl 1-naphthyl phosphorothiolate. Pig liver enzyme, purified 30-fold, demethylated the prochiral substrate dimethyl 1-naphthyl phosphorothionate with 90% stereoselectivity.

77-1695. Wakakura, M.; Suzuki, T.; Uga, S.; Ishikawa, S. (Sch. Ophthalmol., Kitasato Univ., Sagamihara, Kanagawa, Japan). [**Disturbances of the optic nerve in rats administered carbaryl orally for long term.**] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 71(5): 588-591; 1977. (10 references) (Japanese)

Five male Wistar rats (b.w. 180-230 g) were forcibly treated p.o. with carbaryl at 3 mg/animal/week for one year, and after 50 days without treatment they were sacrificed by cervical spinal luxation. Control rats were bred in another room. Upon examination disturbance of optical nerve was recognized as a quantitative reduction in the number of optical nerve fibers. The fibers of moderate diameter and those with large diameters were next most like to be disturbed. When examined by electron microscope the degeneration of axoplasm was most conspicuous, and myelin was also degraded. These findings indicate that carbaryl has a high affinity for axon.

77-1696. Davring, L.; Hultgren, K. (Inst. Genetics, Univ. Lund, Sweden). **Cytogenetic effects on in vivo bone-marrow cells of *Mus musculus* induced by a commercial 2,4,5-T ester product.** *Hereditas* 85(1): 123-134; 1977. (9 references)

A cytogenetic assay was performed on a commercial 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) ester product and its components on in vivo bone-marrow cells of the laboratory mouse, *Mus musculus*. The mutagenic effects were controlled against those of ethylmethanesulfonate and compared with the effects of 2,4,5-T acid. This investigation demonstrated that agents in the commercial 2,4,5-T ester herbicide act both as mitotic poisons and as clastogens. Good agreement was found in the dose-response trend between *Drosophila melanogaster* and the mice tested. This study emphasizes the harmfulness of the 2,4,5-T product from the mutagenic point of view.

77-1697. Hess, F. D.; Bayer, D. E. (Dept. Botany, Colorado State Univ., Fort Collins, CO 80523). **Binding of the herbicide trifluralin to *Chamydomonas* flagellar tubulin.** *J. Cell Sci.* 24: 351-360; 1977. (34 references)

The binding of the herbicide trifluralin to *Chlamydomonas* flagellar tubulin was studied. Colchicine-binding tubulin was isolated from the center two axoneme microtubules from the flagella of the alga *Chlamydomonas eugametos*. Incubating this tubulin with 5.8 μM C-14-labeled trifluralin resulted in significant and reproducible binding of trifluralin to tubulin. The specificity of the binding was determined by demonstrating that limited or no binding occurred to flagellar membrane and matrix protein, higher plant proteins, or bovine serum albumin. It was concluded that trifluralin, at obtainable soluble concentrations, specificially inhibited microtubule-mediated processes in plants. No such effect on animal microtubule systems has as yet been reported, and it is therefore suggested that trifluralin has revealed a pharmacological difference between plant and animal tubulin.

77-1698. Breccia, A.; Gattavecchia, E.; Di Pietra, A. M.; Lumare, F. (Ist. Chim., Fac. Farm., Univ. Bologna, Italy). **Radiobiochemistry of phytodrugs: II. Activity of Altosid and Altozar in the biosynthesis of proteins and RNA in larvae of shrimps in vivo studied by leucine-U-14C and uridine-2-14C.** *J. Environ. Sci. Health* B 12(2): 105-112; 1977. (6 references)

This study concerns the investigation of the effect of various concentrations of Altosid and Altozar, J. H. A., on the biosynthesis of proteins and RNA in cultures of shrimp larvae in vivo measured by the uptake of leucine U-14C, and Uridine-2-14C. The incorporation of leucine follows different behavior patterns in the presence of either 0.01 or 1 ppm concentrations of J.H.A. At any dose Altosid and Altozar decrease the protein synthesis in the shrimp larvae. For the RNA biosynthesis, the uptake of uridine is much higher in the presence of J.H.A. than it is in controls. It is suggested that an abnormal RNA is formed in the first hours, which does not synthesize protein. In this manner the insecticides are effective.

77-1699. Suzuki, T. (Natl. Inst. Agr. Sci., Kita-Ku, Tokyo, 114, Japan). **Metabolism of pentachlorophenol by a soil**

microbe. *J. Environ. Sci. Health* B12(2): 113-127; 1977. (16 references)

The metabolism of pentachlorophenol (PCP) by a microorganism (*Pseudomonas* sp.) isolated from soil was studied. The microorganism degraded the chemical rapidly, releasing carbon dioxide equivalent to about 50% of the chemical added to the bacterial cell suspension in 1 hour after incubation. The liberated carbon dioxide was incorporated rapidly into the cell constituents, and the amino acids in the cell constituents were not much different between the 15 minute and 24 hour incubation periods. Intermediate metabolites of PCP isolated from the incubation medium were identified as tetrachlorocatechol and tetrachlorohydroquinone by spectral analyses.

77-1700. Govindarajan, S.; Hultin, H. O.; Kotula, A. W. (Dep. Food Sci., Univ. Massachusetts, Amherst, MA 01002). **Myoglobin oxidation in ground beef: mechanistic studies.** *J. Food Sci.* 42(3): 571-577, 582; 1977. (20 references)

Studies on some mechanistic features of lipid and pigment oxidation in fresh ground beef are presented. Antioxidants, citric acid and ascorbic acid did not affect the initial slow oxidation of myoglobin but extended the time before rapid oxidation began. Sodium chloride increased the initial rate of pigment oxidation. Lipid extracted from freshly ground, lean beef increased the rate of myoglobin oxidation when added to freshly ground lean beef, while lipid extracted from ground beef stored for 7 days did not. Added linoleic acid was more effective than trilinolein in promoting myoglobin oxidation. Lipase and lipoxygenase enhanced the rate of pigment oxidation while phospholipase A inhibited it. Oxalate inhibited both lipid and myoglobin oxidation and reversed the pro-oxidant capacity of ferrous ions. Ethylenediaminetetraacetic acid also inhibited lipid oxidation but promoted myoglobin oxidation. Arsenic and rotenone both increased the rate of pigment oxidation and slightly increased lipid oxidation; the former effect might have been due to direct inhibition of oxidized myoglobin reduction or to interference with production of reducing equivalent by the electron transport chain.

77-1701. Solomon, L. M.; West, D. P.; Fitzloff, J. F.; Becker, A. M. (Dept. Dermatol., Abraham Lincoln Sch., Coll. Med., Univ. Illinois, Chicago, IL). **Gamma benzene hexachloride in guinea-pig brain after topical application.** *J. Invest. Dermatol.* 68(5): 310-312; 1977. (15 references)

The quantitative and relative distribution of γ-benzene hexachloride (lindane) was studied in blood and brain tissue after topical application of 1% lindane lotion on guinea pigs. The results document the percutaneous absorption of the commercially available lindane lotion in guinea pigs by demonstrating its presence in both blood and brain tissues. Blood and brain levels increased with the number of applications, and for all test groups the level in the brain was at least ten times that in the blood. The animals in both the 2-month old age group and the newborns showed mean brain to blood ratios over a range of 12 to 28 after single and multiple topical applications, with mean blood levels of 0.44 micrograms per milliliter.

77-1702. Karimov, V. A. (Uzbek Scientific Research Institute of Sanitation, Hygiene, and Occupational Diseases, USSR). **Vliianie smesi GKhTsG s rogorom na lipidnyi obmen. [Effect of a mixture of BHC and dimethoate on the lipid metabolism.]** *Med. Zh. Uzbek.* (9): 61-63; 1975. (Russian)

The effect of chronic oral poisoning with a mixture of BHC (3.2 mg/kg/day) and dimethoate (3.8 mg/kg/day, in cottonseed oil) for 3 months on lipid metabolism was studied in male rabbits. Chronic poisoning caused more than threefold increase in the total lipid level of the blood from 179.8 ± 3.2 mg% in the control to 605 ± 17.2 mg%, a 70% increase in the beta-lipoprotein level from 36.7±0.5% to 61±1%, and a 30% increase in the lecithin level from 165±14.4 mg% to 219.6±17.2 mg%. The total cholesterol level of the blood decreased significantly by 60%, from 153.2±5.4% to 93.3±4.1%. The cholesterol-lecithin ratio dropped significantly from 1.0 to 0.42. It was possible to normalize the lipid metabolism by the administration of Galascorbin, methionine, or a combination of these.

77-1703. Khadzhiev, K. Kh.; Sabirova, R. A.; Prigozhin, E. A.; Gul'mirzaeva, I. K. (Dep. Biochem., Tashkent Med. Inst., Tashkent, USSR). **Zhiro-lipoidnyi sostav i morfologicheskie izmeneniia stenki aorty pri vvedenii fosfamida na fone aterogennoi diety. [Lipid and morphological effects in the aorta after administration of dimethoate to animals on an atherogenic diet.]** *Med. Zh. Uzb.* (7): 19-22; 1976. (Russian)

The effect of dimethoate (20% LD_{50}, p.o., 4 months) on lipid metabolism and on the morphology of the aortic wall was studied in Chinchilla rats receiving an atherogenic diet (0.2 g of cholesterol per kg). Dimethoate alone caused insignificant increases in the total cholesterol, phospholipid, and free fatty acid levels in the aortic wall in rabbits kept on normal diet. The increases in these levels were much more pronounced in rabbits kept on the atherogenic diet. The triglyceride levels were significantly increased even in rabbits receiving only dimethoate. The intima showed no particular morphological changes in rabbits treated with dimethoate. The characteristic morphological changes observed after administration of cholesterol (atherosclerotic plaques) were intensified by dimethoate. The findings indicate that prolonged exposure to pesticides against the background of atherogenic diet facilitates the development of sclerotic changes in the aortic wall.

77-1704. Karabaev, Kh. K.; Rakhmatullaev, A. R.; Tursunov, B. S.; Rakhmedova, K. S. (Burn Center, Surg. Dep., I. P. Pavlov Samarkand Med. Inst., Samarkand.

USSR). **Techenie ozhogovoi bolezni pri diltel'nom vozdeistvii malykh doz geksakhlorana v eksperimente.** [**Course of burn disease after chronic experimental treatment with small doses of hexachlorane.**] *Med. Zh. Uzb.* (9): 47-48; 1975. (Russian)

The healing of experimental burns was studied in rats treated with 1 mg/kg/day doses of hexachlorane (BHC) p.o. for 120 days before the trauma. Depression, loss of appetite and weight, hypochromic anemia, leukocytosis, increased residual nitrogen level, and increased erythrocyte sedimentation reaction were found at the end of the poisoning test. The course of the burn was more serious, and the mortality was higher in the group treated with hexachlorane than in the controls. Acceptance of autografts and homografts of skin flaps was also poorer in the test group.

77-1705. Rasulev, B. D. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Dis., USSR). **Gigienicheskoe izuchenie ostatochnykh kolichestv DDT i rogora v raznykh sortakh slivy v zavisimosti ot vneseniia mineral'nykh udobrenii.** [**Hygienic examination of DDT and rogor residues in various varieties of plum as a function of the use of mineral fertilizers.**] *Med. Zh. Uzb.* (3): 49-51; 1976. (Russian)

The effects of nitrogen, phosphorus, and potassium supply to the soil on the DDT and rogor (dimethoate) residues in Burbank, Renclod Welens and Jefferson plums was studied. The trees were sprayed twice with a mixture of 4 kg/ha rogor and 40 kg/ha DDT. The DDT residues were 1.07 mg/kg in Burbank, 0.89 mg/kg in Renclod Welens, and 0.79 mg/kg in Jefferson plums without fertilization at the end of the vegetation period. The corresponding rogor residues were 0.31 mg/kg in Burbank and 0.14 mg/kg in Renclod Welens; Jefferson plums contained no rogor at all. The pesticide residue levels were nearly 50% lower in plums from parcels treated with mineral fertilizers (20-200 kg/ha N, 300 kg/ha P, and 200 kg/ha K).

77-1706. Karimov, V. A. (Uzbek Sci. Res. Inst. Sanit., Hyg., Occup. Dis., USSR). **Vliianie vitamina B_{12}, piridoksina, galaskorbina, metionina na funktsiiu pecheni zhivotnykh, zatravlennykh smes'iu rogora i lindana.** [**Effects of vitamin B_{12}, pyridoxine, galascorbin, and methionine on liver function in animals exposed to a mixture of dimethoate and lindane.**] *Med. Zh. Uzb.* (3): 58-61; 1976. (Russian)

The effect of vitamin B_{12}, Galascorbin, methionine, and vitamin B_6 on the detoxifying and excretory function on the liver was studied in male rabbits treated orally with a mixture of rogor (dimethoate, 3.8 mg/kg/day) and lindane (3.2 mg/kg/day) for 3 months. The chronic poisoning impaired the detoxifying function of the liver; the urinary hippuric acid clearance was 57±3.5% in intact animals and 29±4% at the end of the poisoning test. The hexenal-induced sleep lasted 39±1.5 min in intact animals vs. 17±2.2 min in the experimental ones. The bromsulphalein retention factor was 36±1.8 in intact animals, vs. 64±4.4 in the experimental group. The detoxifying function of the liver normalized most rapidly after treatment of the poisoned animals with methionine + vitamin B_{12}. Vitamin B_6, methionine + vitamin B_6, methionine + Galascorbin + vitamin B_6, methionine, vitamin B_{12}, and methionine + Galascorbin were most efficient in normalizing the excretory function of the liver.

77-1707. Agzamov, R. A.; Arifkhanova, S. I.; Kadyrova, R. A. (Uzbek Sci. Res. Inst. Tuberculosis, USSR). **Vliianie pestitsidov (fosfamida i geksakhlorana) na techenie eksperimental'nogo tuberkuloza.** [**Effects of pesticides (phosphamide and hexachlorane) on the course of experimental tuberculosis.**] *Med. Zh. Uzbek.* (9): 47-48; 1975. (Russian)

The effect of chronic oral administration of phosphamide (dimethoate, 12.5, 5, and 2 mg/kg/day) and of hexachlorane (BHC, 7.5, 3 and 1 mg/kg/day) on the course of tuberculosis induced experimentally by *Mycobacterium bovis* (Bovinus-8) was studied in mice. Giant cells with hyperplasia of the lymphoid tissue of the spleen, emphysema and plethora of the pulmonary vessels, fatty and balooning dystrophy of hepatocytes, focal membranal glomerulonephritis in the kidney, pericapillary and pericellular edema in the brain, fragmentation of muscular bundles and fibers in the myocardium, and edema of the mucosal and submucosal stroma of the stomach were observed in mice treated with phosphamide. Dystrophic, necrobiotic, and circulatory changes were found in the animals treated with hexachlorane. The poisoning with phosphamide and hexachlorane reduced the compensatory and adaptative capacities and the resistance to infection, which resulted in an accelerated generalization of the tuberculotic process compared with the infected control.

77-1708. Khusinov, A. A.; Zhalolov, Z.; Tavmuradov, Kh.; Ismailov, Ya.; Bekchanov, Sh. (Dep. Pathophysiol., Samarkand Med. Inst., Samarkand, USSR). **Vliianie pestitsidov na techenie eksperimental'nogo kavernoznogo tuberkuleza legkogo.** [**Effects of pesticides on the course of experimental cavernous pulmonary tuberculosis.**] *Med. Zh. Uzbek.* (9): 35-38; 1975. (Russian)

The effect of chronic oral administration of hexachlorane (BHC, 2% LD_{50} per kg in dogs) and anthio (formothion, 1% LD_{50} per kg in rabbits) on the course of cavernous tuberculosis induced by mycobacterium H_{37} Rv and Bovinus 8 at different dates after the start of the poisoning was studied. Infection against the background of treatment with hexachlorane and anthio resulted in early and massive dissemination of the tuberculotic process, in the early lysis of the tuberculotic foci, in larger caverns, and in the appearance of multiple caverns. In addition, metaplasia of the bronchial epithelium into multilayered squamous epithelium was observed in the animals treated with anthio. The course of the tuberculosis was more severe than in the infected control animals.

77-1709. Sulinski, A.; Skalska, E.; Obrusiewicz, K. (Dept. Drug Metabolism, Inst. Biopharmacy, Med. Acad.,

Warsaw, Poland). **The activities of acetylcholinesterase, alkaline phosphatase and acid phosphatase of the rat brain following fenchlorphos intoxication.** *Neuropatol. Pol.* 14(4): 451-459; 1976. (12 references)

The poisoning effect of the thiophosphoro-organic pesticide, fenchlorphos, was evaluated on acetylcholinesterase, alkaline phosphatase, and acid phosphatase activity in the rat brain. In studies dealing with acute, single intoxication effects, pesticide in concentrations of 50%, 10%, or 2% LD_{50} dose was used. For 14 day long multidose experiments, pesticide was given in 2%, or 10% the LD_{50} dose every day for the 14 day period. In the acute intoxication studies, two hours after intoxication with all doses the acetylcholinesterase (AChE) activity was changed; 50% and 10% of the LD_{50} doses caused a decrease of the activity down to about 65% and 80% of the controls, resp., 2% of the LD_{50} dose increased the activity to about 135% control levels. In all cases the alkaline phosphatase (A4Ph) activity was decreased. The acid phosphatase activity was also inhibited. After fourteen days of fenchlorphos administration a decrease of AChE activity was noted up to 35% and 60%, for the 100 and 2% LD_{50} dose levels, resp. The A4Ph activity decreased after the 10% dose was given. The AcPh activity was stimulated after application of the highest dose of the pesticide. The results indicate that there is a fast penetration of pesticides into the brain.

77-1710. Rakowska, I.; Dybowska, A.; Malatynska, E.; Kielducka, A. (Dept. Drug Metabolism, Inst. Biopharmacy, Med. Acad., Warsaw, Poland). **The activities of some oxidoreductases and respiratory control in rat brain mitochondria following fenchlorphos intoxication.** *Neuropatol. Pol.* 14(4): 461-469; 1976. (18 references)

The effect of single and repeated intoxication with Fenchlorphos on the degree of coupling of oxidative phosphorylation and the cytochrome oxidase and on the succinate dehydrogenase activities in rat brain mitochondrial fractions was studied. Male albino rats were used. The insecticide was given per os in 1 ml oil solution in 2%, 5%, 10%, and 50% LD_{50} doses, the LD_{50} dose being established as 1250 mg/kg. One group of animals received one dose and were sacrificed 2 or 24 hours later. A second group of animals received doses daily for 14 days. Cytochrome oxidase activity increased two hours after administration of the insecticide at any dose, the strongest effect being noted with the 10% LD_{50} level. A similar effect was noted 24 hours after administration. A significant stimulatory effect was noted after the 14 day test. Succinate dehydrogenase activity decreased after 2 and 24 hours following single intoxication with 50% LD_{50}. Repeated administration of 2% LD_{50} doses led to a significant drop of the activity by 35%. No difference in oxygen consumption in the presence of succinate in respiration states 3 and 4 was noted 2 hours after intoxication with either of the doses used. Fourteen days administration of Fenchlorphos in a dose of 5% or 10% the LD_{50} caused an increase of the oxygen consumption rate in both states 3 and 4. Single and repeated administration in all applied doses caused an increase in the cytochrome oxidase activity in the solubilized brain mitochondrial fractions. High doses led to a decrease in the succinate dehydrogenase activity. Application of low doses had no effect on the enzyme activity after single administration, but appeared inhibitory when administered repeatedly.

77-1711. Cabral, J. R. P.; Shubik, P.; Bronczyk, S. A.; Hall, R. K. (Appley Inst. Res. Cancer, Univ. Nebraska Med. Cent., Omaha, NE 68105). **A carcinogenicity study of the pesticide dieldrin in hamsters.** *Proc. Amer. Assoc. Cancer Res.* 18: 28; 1977.

A study was made to determine whether dieldrin produces tumors in hamsters and to establish dose-response relationships. Syrian golden hamsters were fed dietary concentrations of 0, 20, 60, and 180 ppm dieldrin for life. Survival rate at 50 weeks of age was 66%, comparable to that of controls. Tumor-bearing animals totaled 13% among controls (females) and ranged between 3-15% in treated females. Of the male controls, 8% had tumors, and of the treated males, 16-23% had tumors. The incidences of endocrine organ tumors were comparable in all groups. A hepatoma was found in 1 female and in 1 male fed 180 ppm dieldrin. Treated hamsters had 2 spleen angiomas (1 in controls), 2 lymphomas, 2 stomach papillomas (1 in controls) and 5 tumors of other sites (1 in controls). The present studies show that hamsters tolerate higher doses of dieldrin than do mice or rats. No significant increase in tumor incidence was noted in treated animals over controls.

77-1712. Hwang, C. P.; Lackie, T. H.; Huang, P. M.; Liaw, W. K. (Civil Engineering Dept., Univ. Saskatchewan, Canada). **Mercury concentration in lake sediments of the Upper Qu'Appelle River basin.** *Water Pollution Control* 115(5): 22-24; 1977. (12 references)

This study reports the organic and inorganic mercury content of lake sediments from some of the lakes in the Upper Qu'Appelle River Basin. Information on mercury distribution in these sediments should give indications of the relative magnitudes of mercury pollution from land erosion, agricultural runoff, wastes from the cities, and the transport of mercury downstream. The study showed that Buffalo Pound Lake sediments contained substantially more mercury than the other four lakes. The amount of inorganic mercury in sediments is negligible, and thus organomercury can be considered nearly equal to total mercury. Mercury levels in the water were reported as 0.002 mg/l at Buffalo Pound Lake, and 0.0002 mg/l at the other four lakes. The high level of mercury in lake sedimnts arose from contamination from the soil environment. It is suggested therefore that land management and soil conservation measures are necessary to prevent further enrichment of mercury in lake sediments and deterioration of water quality in these lakes.

77-1713. Parent, A.; Poirier, L. J.; Boucher, R.; Butcher, L. L. (Lab. Neurobiol., Hopital l'Enfant Jesus, Pavillon Notre-Dame, Quebec, Canada). **Morphological characteristics of acetylcholinesterase-containing neurons in the CNS of DFP-treated monkeys. Part 2. Diencephalic and medial telencephalic structures.** *J. Neurol. Sci.* 32(1): 9-28; 1977. (40 references)

The distribution and morphological characteristics of neurons containing acetylcholinesterase in diencephalic and medial telencephalic structures of the rhesus monkey were studied by a pharmaco-histochemical method involving staining for AChE at various times after the administration of DFP. At medial telencephalic levels AChE-containing neurons of medium to large size are present in the bed nucleus of the anterior commissure, in the ascending division of the nucleus of the diagonal band of Broca, and in the so-called "substantia innominata". Most neurons of the olfactory tubercle are devoid of AChE, but lie within a lightly-stained AChE background. Clusters of amorphous and highly reactive AChE material are in the islands of Cajella and along the ventromedial edge of the olfactory tubercle. At the level of the thalamus, the strongest AChE staining is in the perikarya of the anterior dorsal nucleus and the most nuclei located within the fibrous or lamellar thalamic structures. At the level of the hypothalamus intense staining for AChE occurred in the neuronal somata of the supraoptic and paraventricular nuclei. In the paraventricular nucleus the AChE-positive perikarya are of medium size and have numerous AChE-containing processes. The main cellular aggregate of the supraoptic nucleus extends caudad and is composed of a large group of moderately to intensely stained neurons lying along the optic tract and which constitute the caudal, or infundibular, portion of the supraoptic nucleus. Other moderately to intensely stained AChE neurons are in the lateral and perifornical areas and most particularly in the dorsal hypothalamic area. Moderately stained AChE neurons are in the supramammillary area and in neurons of the ventromedial nucleus of the monkey hypothalamus are devoid of AChE. Many of the AChE neuronal populations identified herein lie within some of the phylogenetically oldest parts of the primate brain.

77-1714. Takizawa, A.; Nakayama, E.; Ishizu, S.; Momotani, H.; Sato, M.; Mori, N. Sato, M. (Sch. Publ. Health, Tokyo Women's Med. Coll., Tokyo, Japan). [**Experimental studies on hydrogen cyanide intoxication.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 32(1): 205; 1977. (Japanese)

Aqueous solutions of potassium cyanide at levels of 810, 270, 90, 30, 10 and 3 mg/l were administered ad libitum to groups of adult male rats for 2 months, and the variation of thiocyanate in their urine was determined during this period. After 78 days of administration, the thiocyanate, RBC, WBC, hematocrit (%), hemoglobin, and protein levels in the plasma of the groups given 270, 30, and 3 mg/l were determined, as well as GOT, GPT, Al-p, LDH, LAP, cholesterol, and glucose. The excreted amount of thiocyanate increased with increasing potassium cyanide content in the drinking water with a correlation coefficient of 0.96 ($y = 1.32x - 7.72$). As the concentration of potassium cyanide increased, the amount excreted in urine became larger, without increases in the level of thiocyanate in the plasma. Except a for tendency of decreasing GPT in plasma, no conspicuous change was seen in the hematologic parameters.

77-1715. Hirata, H.; Sakama, H.; Nishimura, M. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan). [**Metabolism of a herbicide, methyl 3,4-dichlorocarbanilate, in mouse.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 32(1): 202; 1977. (Japanese)

The metabolism of methyl 3,4-dichlorocarbanilate (Swep) in the mouse was studied by orally administering 420 mg of phenyl-^{14}C-labeled carbanilate/kg to 5-week-old male STD-ddy mice. Following herbicide administration their urine and feces were collected daily for 5 days to determine the radioactivity, and the organs of untreated control mice mouse were analyzed as well as the whole-body autoradiographs. It was shown that the orally administered swep was swiftly distributed throughout the mouse body and was almost completely excreted within 48 hr in urine and feces, especially urine. In feces swep was excreted virtually unchanged, however, in urine it was metabolized into water-soluble substances conjugated with glucuronic acid and sulfuric acid. Swep is mainly used as a herbicide in paddy fields.

77-1716. Matsushita, T.; Yoshioka, M.; Nomoura, S.; Arimatsu, T. (Sch. Hyg., Fac. Med., Kagoshima Univ., Kagoshima, Kagoshima, Japan). [**Relation between the chemical structure of dithiocarbamate fungicides and the appearance of contact allergy.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 32(1): 201; 1977. (Japanese)

Maneb, mancozeb and zineb as 70% ethanolic dilutions, and ferbam, thiram, ziram, dimethyldithiocarbamic acid, its sodium salt, and lime-sulfur mixture as aqueous dilutions were tested as contact allergy inducers in the guinea pig. For the intradermal test a 5% dilution strength and for patch tests a 25% dilution were adopted. Ethylene bis-dithiocarbamates were stronger sensitizers than dimethyldithiocarbamates. Sodium dimethyldithiocarbamate did not show ability for sensitization. Lime-sulfur mixture showed moderate sensitization. Specificity was suggested between the chemical structure and appearance of contact allergy due to dithiocarbamates. Cross-sensitization was observed among ethylene-bis-dithiocarbamates, while that among the dithiocarbamates was less. Cross-sensitization between ethylene-bis-dithiocarbamates and dithiocarbamates was observed to various degrees. Cross-sensitization between lime-sulfur mixture and these dithiocarbamates was shown with slight to strong degree.

77-1717. Hirosawa, H. (Sch. Ophthalmol., Fac. Med., Kitasato Univ., Sagamihara, Kanagawa, Japan). [Ex-

perimental retinal degeneration due to organophosphorus pesticide.] *Nippon Ganka Gakkai Zasshi (Acta Soc. Ophthalmol. Jpn.)* 81(suppl): 20; 1977. (Japanese)

To evaluate the possibility of fenthion causing retinal degeneration, 30 Long-Evans rats were each injected subcutaneously with 50 mg of fenthion per kg b.w. on the back every 4 days. Their body weight, fundus, and ERG were observed periodically for about one year, with histological observation of the retina. ERG of treated rats became subnormal within 3 months after the commencement of administration; however, no conspicuous changes were seen in fundus and histology. Within one year after commencing administration, the ERG became nonrecordable, with appearance of pigmented spots in the fundus and highly constricted blood vessels. Histologically, conspicuous degeneration was found in the pigmented retinal epithelium and the optic cell layer.

77-1718. Nagamori, H.; Kurisaki, E.; Sato, H. (Fukushima Prefect. Med. Coll., Koriyama, Fukushima, Japan). [**Effects on drugs and poisonous materials on cultured cell of human fetus. Response of the cells to paraquat dichloride.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 30(3): 248; 1976. (Japanese)

The effects of paraquat dichloride on human cell nuclei and human fetal cells on monolayer culture were studied. Stainability by nigrosin, deformation, atrophy, and disappearance of nucleus and cytoplasm of the cells were more severely affected in the range of paraquat concentrations between 1 and 10 ppm. Almost no difference in response between the organs from which the cells were derived was recognized. The effect of paraquat on nucleic acid synthesis could not be observed because of difficulties in staining DNA and RNA. Formation of minute fat particles was found at 1 ppm of paraquat; the size of these particles increased with increasing paraquat concentration, showing cellular denaturation between 1 and 10 ppm of paraquat. The protein content of the individual cells showed some decrease upon treating with paraquat; however, this was not significant.

77-1719. Fujita, K. (Retroperitoneal Section, Saku General Hosp., Usuda, Nagano, Japan). [**Antispermatogentic actions of methyl phosphate insecticides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(4): 594-598; 1976. (4 references) (Japanese)

The effects of long-term oral administration of methyl phosphate insecticides, malathion, fenitrothion and dichlorvos were studied using rhesus monkeys (malathion, 0, 2.6, 10, and 16.2 mg/kg/day for 19 weeks) and rabbits (malathion, 0.30, 60 and 120 mg/kg/day for 27 weeks, fenitrothion, 0, 1, 3 and 10 mg/kg/day for 12 weeks, and dichlorvos, 0, 0.2, 0.5, 1.5 and 5.0 mg/kg/day for 12 weeks). Particular emphasis was placed on the spermatogenetic function, using a testicular biopsy score count. Although no difference was seen between the scores for the two testes, a general tendency of reducing score with the increasing dose of phosphates administered was found clearly in the case of malathion and dichlorvos. The group of fenitrothion (24 rabbits) gave exceptionally high mortality (9 rabbits) and thus no clear result was obtained. In addition to the reduction of the biopsy score fibrosis of the basal membrane of the seminiferous tubule, vacuolation of testicular cells, and appearance of giant cells were observed paralleling the reduction.

77-1720. Tsutsui, J.; Nakabayashi, H.; Suzuki, H.; Ogura, K. (Lab. Rural Med., Chusei Gen. Hosp., Tsu, Mie, Japan). [**Studies on the toxicity of paraquat. Part I.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(4): 614-621; 1976. (22 references) (Japanese)

Paraquat, dissolved in distilled water, was administered orally to groups of male Wistar rats (b.w. 170-190 g) at levels of 100, 50, and 25 mg/kg/day. The rats generally died within 1-5 days, and those given 100 mg/kg almost all died within 24 hr. Body weight losses began after the second administration. It was found that paraquat showed a tendency to accumulate mostly in the lung, 7.56 μg/g after 2 hr, but it was excreted from lungs very soon, as in other organs, not remaining after 72 hr. After paraquat administration, serum LDT and GOT values were increased, but the hematological test data were normal. Histopathologically, the impairment due to paraquat was most severe in the lung, with atelectasis, pulmonary edema, and destruction of alveolar epthelium at first, followed by proliferative symptoms such as proliferation of fibroblasts and peripheral bronchiolar epithelium. Histological impairments in the heart, liver, and kidney were most severe 24 hr after the administration, then gradually recovered.

77-1721. Ogawa, K.; Tsuda, M.; Yamauchi, F.; Yamaguchi, I.; Misato, T. (Inst. Phys. Chem. Res. Wako, Saitama, Japan). [**Metabolism of 2-*iso*-propylphenyl *N*-methylcarbamate (Mipcin R, MIPC) in rice plant and its degradation in soils.**] *J. Pestic. Sci.* 2(1): 51-57; 1977. (9 references)

^{14}C-Mipcin (isoprocarb) labeled on the methyl of the isopropyl group of the ring substituted side chain was synthesized and used to investigate the absorption, translocation, and metabolism of Mipcin in rice plants. Soil degradation was also investigated. Mipcin was easily absorbed via roots and leaves of rice plants, translocated to upper plant parts, and discharged from leaves. The predominant metabolites detected in straw were 2-(1-hydroxy 1-methylethyl) phenyl *N*-methylcarbamate and 2-isopropylphenyl N-hydroxymethyl carbamate. Conjugated metabolites which hydrolyzed to 2-isopropyl phenyl carbamate with HCl were observed in grain. Mipcin degraded more rapidly in upland soil conditions than under flooded conditions. The main degradation product under upland conditions was 2-iso-propyl phenyl carbamate, and under flooded conditions it was 2-iso-propyl phenol. These metabolites were less active as cholinesterase inhibitors than the parent compound.

77-1722. Miyamoto, J. (Research Dept., Pestic. Div., Sumitomo Chem. Ind. Co. Takarazuka, Hyogo, Japan). [**Studies on environmental toxicology of pesticides.**] *J. Pestic. Sci.* 2(2): 215-225; 1977. (63 references) (Japanese)

A general description is given on the results of research on the metabolism, degradation and toxicology of pesticides such as fenitrothion, cyanox, cyanofenphos, salithion, a phosphoroamidate herbicide, 3,4-xylyl *N*-methylcarbamate, and a sulfur-containing fungicide. The effectiveness of PTD using monocrystals of potassium bromide as a thermionic detector in gas chromatographic residue analysis was described. A simple method of screening for carcinogenicity of pesticides using rats with partially excised livers fed ^{3}H-tymidine was explained. Using this method liver DNA was radiolabeled, and then the breakage and repair of DNA by pesticides were detected. Research was also conducted on the metabolism of synthetic pyrethroids. The author emphasized that studies on the environmental toxicology of pesticides should be directed toward early screening to eliminate dangerous candidate pesticides before commercial development.

77-1723. Rusness, D. G.; Still, G. G. (USDA, ARS, Fargo, ND 58102). **S-Cysteinyl-hydroxychlorpropham transferase inhibition by chlorpropham analogs, sulfhydryl compounds, ortho, and/or para-substituted phenols, and firefly luciferin.** *Pestic. Biochem. Physiol.* 7(3): 232-241; 1977. (10 references)

The *S*-cysteinyl-hydroxychlorpropham transferase activity of partially purified enzymes A and B from oat shoots was assayed in the presence of chlorpropham analogs, sulfur-containing compounds, and substituted phenols. No enzyme inhibition was noted with the beta-*O*-glucoside of the substrate, isopropyl-3'- chloro-4'- hydroxycarbanilate, or the isopropyl-3'- chlorocarbanilate. Isopropyl-5'- chloro-2'- hydroxycarbanilate was a competitive inhibitor with respect to 4-hydroxychlorpropham, but 2-beta-*O*- glucosyl-5- chlorpropham was not an inhibitor. The inhibition patterns exhibited by 2-hydroxy-*S*-chlorpropham and other aryl-hydroxylated analogs suggested that the site of aryl-cysteine thioether conjugation might be the ortho aromatic carbon. Inhibitions by 3-chloro- 4-hydroxyaniline and ferulic acid suggest that related phenols and/or naturally occurring phenolic plant acids could serve as substrates for the enzyme system. Glutathione was a competitive inhibitor with respect to cysteine and could form a conjugate with 4-hydroxychlorpropham. Atypical inhibitions of cysteine conjugation by cysteine ethyl ester or firefly D-luciferin were noted. Similarities between *S*-cysteinyl- hydroxychlorpropham transferase and firefly luciferase were observed.

77-1724. Usui, K.; Fukami, J. I.; Shishido, T. (Inst. Physical and Chem. Res., Saitama 351, Japan). **Insect glutathione *S*-transferase: separation of transferases from fat bodies of American cockroaches active on organophosphorus triester.** *Pestic. Biochem. Physiol.* 7(3): 249-260; 1977. (43 references)

Investigations using the fat bodies of American cockroaches were undertaken to characterize the transferase catalyzing the conjugation of reduced glutathione (GSH) with organophosphorus triesters and to compare them with the other transferases such as aryl and alkyl transferases. Several glutathione *S*-transferases which catalyze the conjugation of GSH with organophosphorus triesters were separated from the cockroaches, *Periplaneta americana* (L.). Two transferases (I, V) were active on diazinon and three (II, III, IV) were active on methyl parathion. The transferase I active on the pyrimidinyl moiety of diazinon was distinguishable from the others on the *O*-methyl portion of methyl parathion, and was almost inactive or less active on 3,4-dichloronitrobenzene, methyl iodide, *p*-nitrobenzyl chloride, *trans*-cinnamaldehyde, and 1,2-epoxy-3- (*p*-nitrophenoxy) propane. Transferase II had high activities with aryl and aralkyl compounds, transferase III with epoxide and alkene, and transferase IV with alkyl, aryl, and aralkyl compounds. This indicated that the transferases had overlapping substrate specificities. The molecular weight was 35,000-37,000 for both enzymes active on methyl parathion and diazinon. The pH optima with methyl parathion and diazinon were about 8.5 and 6.5, respectively. At a glutathione concentration of 5 mM, Michaelis constants were 0.28 and 0.13 mM for methyl parathion and diazinon, resp.

77-1725. Chambers, H.; Dziuk, L. J.; Watkins, J. (Dept. Entomol., Mississippi State Univ., Mississippi State, MS 39762). **Hydrolytic activation and detoxication of 2,4-dichlorophenoxyacetic acid esters in mosquito fish.** *Pestic. Biochem. Physiol.* 7(3): 297-300; 1977. (4 references)

A study was made to define more clearly the role of hydrolytic enzymes both in the activation or detoxication of esters of 2,4-D and in the tolerance to these esters in mosquito fish. Insecticide-resistant mosquito fish (*Gambusia affinis*) were slightly more tolerant to two thiol esters of 2,4-D than were fish of a susceptible population. DEF (*S,S,S*-tributyl phosphorotrithioate) at 0.1 ppm for 24 hr slightly decreased the toxicity of both esters to both populations. Comparison of esterase activities in gill and liver preparations showed that the resistant fish had lower levels of liver esterases than did susceptible fish, but results with gill preparations were not consistent. Susceptible fish had the higher activity with the ethyl thiol ester, but resistant fish had the higher activity with the butyl thiol ester. DEF inhibited activities in both tissues of both populations, but inhibition was appreciably greater in the liver. These results suggest that hydrolysis in the liver activates 2,4-D esters, that hydrolysis in the gill is a detoxication reaction, that the slight increase in tolerance in the insecticide-resistant fish is primarily the result of decreased activation, and that antagonism by DEF is the result of a greater inhibition of activation than of detoxication.

77-1726. Skalsky, H. L.; Guthrie, F. E. (Dept. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Affinities of parathion, DDT, dieldrin, and carbaryl for macromolecules in the blood of the rat and American cockroach and the competitive interaction of steroids.** *Pestic. Biochem. Physiol.* 7(3): 289-296; 1977. (27 references)

This investigation was designed to measure binding constants for various protein-pesticide complexes and to determine whether competition occurred between the pesticide and certain endogenous substrates. Specifically, the binding of DDT, dieldrin, parathion, and carbaryl to macromolecules of rat and roach blood were studied. Plasma was filtered on Sephadex G-200, and the first protein peak (FPP) was used to investigate binding characteristics for the insecticides. Binding was demonstrated to be of a non-specific hydrophobic nature, except for roach FPP and dieldrin in which, in addition to low-affinity binding, sites for high-affinity binding were also found. Competitive binding experiments were run with cholesterol, estrogen, DDT, and dieldrin. No significant competitive interactions were observed.

77-1727. Rusness, D. G.; Still, G. G. (USDA, ARS, Fargo, ND 58102). **Partial purification and properties of *S*-cysteinyl-hydroxychlorpropham transferase from oat (*Avena sativa* L.)** *Pestic. Biochem. Physiol.* 7(3): 220-231; 1977. (13 references)

S-Cysteinyl and glutathione conjugates of isopropyl-3′- chloro-4′- hydroxycarbanilate (4-hydroxychlorpropham) were synthesized directly in the presence of soluble enzyme systems isolated from etiolated shoots of oat seedlings. The enzyme systems responsible for these reactions were partly purified and characterized. Enzyme A appeared to be a multicomponent system, equally reactive with either cysteine or glutathione. Enzyme B was twice as active as enzyme A in the formation of *S*-cysteinyl hydroxychlorpropham. Affinity chromatography of enzyme A produced an enzyme fraction with properties similar to those of enzyme B. Both enzymes were significantly inhibited by increased cysteine concentrations. The reaction of glutathione with enzyme B was limited. However, when low concentrations of a non-reacting effector, cysteine ethyl ether, were added, glutathione conjugation increased significantly. At higher concentrations, cysteine ethyl ester formed a conjugate with 4-hydroxychlorproham. Isopropyl- 5′-chloro- 2′-hydroxycarbanilate (2-hydroxy-5- chlorpropham) did not conjugate with either cysteine or glutathione but did react with cysteine ethyl ester. Isopropyl-3′- chlorocarbanilate (chlorpropham) was not a substrate for thioether conjugation. These data suggest that para- and/or ortho-hydroxylated carbanilates and cysteine-related substrates may form thioether conjugates when incubated under appropriate conditions with these complex enzyme systems.

77-1728. Still, G. G.; Rusness, D. G. (USDA, ARS, Fargo, ND 58102). **S-Cysteinyl-hydroxychlorpropham: formation of the *S*-cysteinyl conjugate of isopropyl-3′-chloro-4′-hydroxycarbanilate in oat (*Avena sativa* L.)** *Pestic. Biochem. Physiol.* 7(3): 210-219; 1977. (17 references)

Evidence is reported for a new conjugate of 4-hydroxychlorpropham, believed to te *S*-cysteinyl- hydroxychlorpropham, from both in vitro and in vivo oat systems. Isopropyl-3′- chlorocarbanilate (chlorpropham) forms phenolic metabolites, isopropyl-3′- chloro-4′- hydroxycarbanilate (I), and isopropyl-5′- chloro-2′- hydroxycarbanilate (II), in several plant species. In oat, I was converted to a *S*-cysteinyl-conjugate (III). The reaction in vitro was catalyzed by a partially purified, soluble enzyme. The formation of III by the enzyme preparation and by oat shoot sections was compared. Mass spectral data indicated the presence of an aryl-thioether bond, and chloro-, hydroxy-, and isopropylcarbanilate groups in III. The results of this study indicate that III was isopropyl-[(2-amino- 2-carboxyethyl) thio]-chloro-hydroxycarbanilate (*S*-cysteinyl hydroxy- chlorpropham).

77-1729. Hawxby, K.; Tubea, B.; Ownby, J.; Basler, E. (Res. Dept. Langston Univ., Langston Univ., Langston, OK 73050). **Effects of various classes of herbicides on four species of algae.** *Pestic. Biochem. Physiol.* 7(3): 203-209; 1977. (16 references)

As part of a study on the rate of herbicide accumulation and degradation by soil and aquatic algae, the effect of several herbicides on growth, respiration, and photosynthesis was measured in four species of algae. *Chlorella pyrenoidosa*, *Chlorococcum* sp., *Lyngbya* sp., and *Anabaena variabilis* were cultured in Bold's basic medium. They were treated with 0.1, 1.0, and 10 μM concentrations of alachlor, terbuthylazine, dinoseb, profluralin, prometryne, and 2,4-D. Growth of all algal species tested was markedly reduced by triazines. Alachlor, dinoseb, and fluometuron inhibited growth of some algae at higher concentrations while 2,4-D and profluralin did not inhibit growth at the concentrations tested. Photosynthesis was greatly inhibited by the triazines, even at the 0.1 μM concentration. Fluometuron was very toxic to the blue-green algae, but had less effect on the green algae tested. *Lyngbya* was most susceptible to photosynthesis reduction by the herbicides. The concentrations of herbicides tested had little effect on respiration of the algae species. It appears that effects on algal growth were due primarily to inhibition of photosysnthesis rather than to other metabolic processes.

77-1730. Skorupska, H. (Agric. Acad. Poznan, Poland). **Uboczne dzialanie mutagenne pestycydow. [Incidental mutagenic effects of pesticides.]** *Postepy Nauk Roln.* 28(5): 99-106; 1976. (51 references) (Polish)

The mutagenic effect of pesticides on plant and animal life is described. Their presence disorganized the cellular system in living organisms. Pesticides affected the synthesis and function of enzymes causing disorders in the synthesis of proteins and of nucleic acids or caused

changes in enzyme activity by altering gene action. Organophosphates are particularly phytotoxic and were shown to change chromosomal structure and increase chromosome number in plant cells. Organochlorine insecticides acted strongly on the nuclear system of organisms. Their metabolites, reacting with amino and sulfhydryl groups of amino acids, produced changes in the chromosomal structure. In the nuclei of bone marrow cells of mice receiving small doses of organochlorine compounds, chromosomal damage similar to that caused by radiation was noticed. Pesticides containing mercury or lead were also mutagenic, inhibiting enzyme activity of higher plant species or worsening their energy balance. Zn- and Mn-containing fungicides and nitroaniline-as well as carbamate-derived fungicides were found to be genetically active. Urea-type, carbamate, and triazine herbicides were equally dangerous. Changes were most frequently localized in cell ribosomes, altering protein and nucleic acid synthesis.

77-1731. Nakamura, I.; Kudo, Y.; Horie, Y.; Nishida, N. (Sch. Hyg., St. Marianna Med. Coll., Kawasaki, Kanagawa, Japan). [**Changes in peripheral red blood cells of rabbits caused by pesticides.**] *Proc. Annu. Meet. Jpn. Assoc. Ind. Health* 50: 254-255; 1977. (Japanese)

Changes in peripheral red blood cells of rabbits (males, white b.w. 2 kg) administered pesticides by two methods were determined. The first method was subcutaneous injection of an aqueous suspension, once a day for 5 days at level of one tenth of the LD50 (oral) of methyl thiophanate, *m*-tolyl *N*-methylcarbamate (MTMC), methomyl, chlordimeform, chlorobenzilate, and butachlor, and one twentieth LD50 of CNP (MO). The pesticides were used in the commercial forms. The second method was subcutaneous injection of olive oil suspension, once a day for 16 days at level of one hundredth of the LD50 (oral) of technical grade methyl thiophanate, *m*-tolyl *N*-methylcarbamate, chlorobenzilate, fenitrothion and butachlor. A mixture of *m*-tolyl *N*-methylcarbamate and fenitrothion at one hundredth and one two-hundredth LD50 respectively was also injected. By the first method, the increase of reticulocytes and appearance of punctate basophilic erythrocytes were found in the animals given methyl thiophanate, CNP and chlorbenzilate. Using the second method, the same phenomena were seen for methyl thiophanate, *m*-tolyl *N*-methylcarbamate, CNP, butachlor, and chlorobenzilate, respectively. The results of the two experiments show the same increase of reticulocytes and appearance of punctate basophilic erythrocytes (P.B.E.), indicating an action of these pesticides on hematopoietic function in mammals. The high percentage of P.B.E. in the farmers in two villages might be at least partially due to these pesticides.

77-1732. Sugimoto, T. (Inst. Biol., Nihon Noyaku Co. Ltd. Nagano, Osaka, Japan). [**Occurrence and reduction of ocular impairment due to antibiotics.**] *Proc. Annu. Meet. Jpn. Assoc. Ind. Health* 50: 256-257; 1977. (Japanese)

The occurrence of ocular impairment, its symptoms, its change over time following eye irrigation with 5 kinds of antibiotics (protein synthesis inhibitors), and the action of calcium acetate were studied on white male guinea pigs (5 per group). The antibiotics used were blasticidin S, nucleocydine, puromycin, pactamycin, and tetracycline, 0.01 microliter per eye. No direct relationship was seen between the occurrence of ocular impairment and the inhibition of protein synthesis due to the tested antibiotics; however, ocular impairment was strongest by nucleocydin, followed by blasticidin S. The symptoms following these were seen in the cornea. At high levels, pactamycin caused palpebritis and conjunctival hyperemia, but no corneal opacity. The effectiveness of calcium acetate in reducing ocular impairment when it was administered with nucleocydine was apparently observed because no corneal opacity occurred. However, the action was weaker than when it was given with blasticidin S.

77-1733. Hayami, H.; Hasegawa, T.; Ogata, M. (Sch. Publ. Health, Fac. Med., Okayama Univ., Okayama, Japan). [**The effects of various *N*-methylcarbamate pesticides on the biological membrane with specific reference to comparing their actions in the test tube.**] *Proc. Annu. Meet., Jpn. Assoc. Ind. Health* 50: 264-265; 1977. (Japanese)

The difference in the mechanism of toxic effects on the biological membrane of the rat (Donryu-strain) liver between three methylcarbamate insecticides, carbaryl, MTMC, and isopropham were examined. Different patterns of oxygen consumption accompanying oxidative phosphorylation were seen, in that only 3,5-xylyl *N*-methylcarbamate (MTMC) inhibited the transfer of energy. Moreover, it was found that carbaryl was stronger than other carbamates in eluting potassium ion through the mitochondrial membrane. This fact suggests that carbaryl is stronger in deconjugating action than other carbamates. Thus, in addition to cholinesterase inhibition, these *N*-methylcarbamates have the above mentioned action on biological membranes as their toxic mechanism.

77-1734. Kawai, M.; Yatomi, A.; Someya, N.; Tojo, K.; Ueda, K. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan). [**Comparative studies on cholinesterase activity III. DTNB method and pH method in carbamate pesticide intoxication.**] *Proc. Annu. Meet. Jpn. Assoc. Ind. Health* 50: 266-267; 1977. (Japanese)

The cholinesterase activity in rats intoxicated by a carbamate such as methomyl (40 mg/kg), propoxur, and pirimicarb (150 mg/kg), which are said to bind weakly with cholinersterase, was determined by the pH reduction method and by the acetylthiocholine-DTNB method. The rats were sacrificed when they showed tremors after pesticide administration, and their blood and brains were collected. According to the Δ pH method, whole blood cholinesterase activity and brain cholinesterase activity were not so severely inhibited as indicated by the acetylthiocholine-DTNB method. On the contrary, in rats

intoxicated with parathion the results were almost the same. According to the symptoms, the acetylthiocholine-DTNB method was considered to afford more accurate results. The collected blood must be kept at 4°C and analyzed in less than 4 hr, because its cholinesterase activity was largely restored after 4 hr at 25°C. The time change of the blood cholinesterase activity of workers in a pesticide factory showed that the plasma cholinesterase activity was more sensitive to carbamate exposure than was the whole blood cholinesterase activity; however, as the former is vulnerable to other factors, it is more reliable to determine both activities simultaneously.

77-1735. Sakama, H.; Nishimura, M. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan). [**Inhalation toxicity of organophosphorus pesticides. II. Approach to establishment of permissible concentration.**] *Proc. Annu. Meet. Jpn. Assoc. Ind. Health* 50: 268-269; 1977. (Japanese)

The acute inhalation toxicity (LC 50) and concentration for 50% inhibition of blood cholinesterase activity (IC50) of fenitrothion and dichlorvos to rats (male Wistar strain) were determined, and their inter-relationship was discussed for establishing the TLV of these organophosphorus pesticides. The LC50 of fenitrothion could not be obtained because not all the rats exposed for one hr to the maximum concentration of 3285 mg/kg died. The IC50 for plasma cholinesterase activity and that of erythrocyte cholinesterase were 130 and 340 mg/m^3. The LC50 of dichlorvos was calculated to be 140 (120-160) mg/m^3. In another experiment, the LD50 p.o. of dichlorvos and fenitrothion was found to be 110 and 340 mg/kg, respectively. Therefore, dichlorvos has an inhalation LC50 equal to one-eighteenth of that of fenitrothion.

77-1736. Karminski, W.; Olszanowski, A. (Inst. Chem. Organ. Technol., Silesian Polytech. Coll., Gliwice, Poland). **Zaleznosc aktywnosci biologicznej i biodegradacji analogow DDT of ich struktury.** [**Interdependence of biological activity and biodegradation of DDT analogs regarding their structure.**] *Pryzemysl. Chem.* 55(7): 349-353; 1976. (9 references) (Polish)

The biological activity of newly synthesized DDT analogs and their susceptibility to enzymatic biodegradation have been evaluated in relation to their structural configuration. In order for them to replace DDT, they would have to demonstrate insecticidal properties, stability under atmospheric conditions, and transformation into non-toxic, polar compounds readily secreted by warm-blooded animals. Biodegradation by means of multifunctional oxidases (MFO) occurred much faster with alkyl, alkoxy, or alkylthio substituents in *para*-position on the benzene rings of the analogs. Their oxidative biodegradation led to reduced environmental pollution. The lesser effectiveness of these compounds against pests could be compensated by using them with synergistic derivatives of 1,3-dioxal to inhibit MFO. Most promising of the substances studied were asymmetric DDT analogs with CH_3S, $C_2H_5 > CH_3S$, $CH_3O > CH_3$ etc. as substituents in *para*-position in terms of insecticidal potency, low mammalian toxicity, and rapid biodegradation. The biological testing of DDT analogs was based on the ecological magnification index (ratio of concentration of the compound under study in the animal organism to its concentration in water); biodegradability index (ratio of polar to nonpolar metabolites), water solubility of the compounds, and LD50 of the compounds themselves and their synergists for susceptible and resistant insect strains.

77-1737. Overstreet, D. H.; Helps, S. C.; Prescott, A. M.; Schiller, G. D. (Sch. Biol. Sci., Flinders Univ. of South Australia, South Australia, 5042). **Development and disappearance of subsensitivity to pilocarpine following a single administration of the irreversible anticholinesterase agent, DFP.** *Psychopharmacology* 52(3): 263-269; 1977. (25 references)

The possibility that subsensitivity to pilocarpine may occur following a single injection of the irreversible anticholinesterase agent, diisopropyl fluorophosphate (DFP), was studied using male Sprague-Dawley rats. In the first experiment the rats drank from experimental drinking chambers for 1/2 hr per day. Pilocarpine hydrochloride (8 mg/kg) was injected 5 min before the drinking session. One week later DFP or the arachis oil vehicle (1 mg/kg) was injected i.m. and injections of pilocarpine were given at varying intervals thereafter. The results provided evidence for the development of subsensitivity to pilocarpine following a single injection of DFP. In a second experiment the hypothermic effects of pilocarpine were reduced in rats acutely treated with DFP. These data indicate that subsensitivity to pilocarpine can reflect a reduced sensitivity of postsynaptic receptors to acetylcholine, which may partly account for the behavioral recovery of the rats while acetylcholinesterase activity is still markedly depressed.

77-1738. Heene, R. (Univ. Nervenklinik, 3550 Marburg/Lahn, Germany). **Experimental myopathies and muscular dystrophy. Studies in the formal pathogenesis of the myopathy of 2,4-dichlorophenoxyacetate.** *Schriftenr. Neurol., Neurology Series* 16: 1-97; 1975. (319 references)

The histochemical types of muscle fibers are described and a report presented on the histological and histochemical alterations in skeletal muscles of rats given i.p. injections of 2,4-D. The liver and myocardium were also examined. In skeletal muscle alterations occurring acutely within 1 to 1.5 hours after injection of 300 mg/kg 2,4-D could be distinguished from changes developing subacutely in the course of treatment with repeated injections of one quarter to one half the LD50 of 2,4-D. The principal histochemical effect of acute intoxication was leakage of phosphorylase and glycogen from white muscle fibers, while some of the red fibers showed an increase in primary glycogen and phosphorylase activity. The gastrocnemius and soleus muscles displayed only minor or no alterations. Under conditions of subacute intoxication a

myopathy of white type 2B/Am fibers developed. Segmental swelling of type-2 fibers was the first histological sign of fiber damage; it was always accompanied by loss of glycogen and of phosphorylase, glycogen synthetase, and succinodehydrogenase activities. These changes preceded fiber necrosis. Studies of liver specimens revealed loss of glycogen and of phosphorylase activity from portal areas in the early stages of the disease, and in the later stages an additional decrease in dehydrogenase activities, together with intracellular decomposition of fat droplets in the periphery of the liver lobules. The myocardium of the ventricles did not show any clear alterations. As regards formal pathogenesis, the myopathy of 2,4-D in the rat is related to the myopathy of vincristine in this species and to hereditary myopathy in the mouse. The concepts derived from the studies in experimental myopathies are extended to problems of Duchenne muscular dystrophy in man. On the whole, it is concluded that myopathy of 2,4-D can be regarded as a suitable model for studying primary myopathies in animals and man. In addition, histochemical findings are presented on the in vitro effects of 2,4-D on muscle phosphorylase.

77-1739. Sakurai, K.; Kasai, T. (Biol. Lab., Nihon Noyaku Co., Ltd., Osaka, Japan). [**Teratological studies on isoprothiolane in mice.**] *Sento Ijo (Congenital Anomalies)* 16(4): 250-251; 1976. (Japanese)

To determine the teratologic activity of isoprothiolane, a fungicide for rice plants, diisopropyl 1,3-dithiolane-2- ylidenemalonate it was fed to female ddy-mice after mixing with daily feed at two levels of 100 and 1000 ppm, corresponding respectively to about 20 and 200 mg/kg/day from day 0 of pregnancy to the sacrifice day or day of delivery. Another group of the mice was forcibly treated at a level of 600 mg/kg/day from 6 to 12 day of pregnancy. In all groups which were sacrificed late in gestation there was no significant difference in number of implantations and fetal absorptions from those of controls. Two cases of polydactylia were found in fetuses from one mother in the 1000 ppm group (15 mothers). Decreased fetal body weight, decrease in the number of ossified coccygeal vertebra, and increase of incomplete ossification of the vertebral cervical arch were seen significantly in the 600 mg/kg group as compared to controls. In all groups with spontaneous delivery no differences in number of implantations and perinatal mortality were found between the treated group and controls. The growth of newborns, and the skeleton and internal organs of pups at weaning showed no anomalies. Based on these findings it was considered that isoprothiolane had no teratogenic action in the mouse.

77-1740. Sjoblad, R. D.; Bollag, J. M. (Lab. Soil Microbiol., Dep. Agron., Pennsylvania State Univ., University Park, PA 16802). **Oxidative coupling of aromatic pesticide intermediates by a fungal phenol oxidase.** *Appl. Environ. Microbiol.* 33(4): 906-910; 1977. (15 references)

The soil fungus *Rhizoctonia praticola* produced an enzyme that accumulated in the growth medium and caused the polymerization of phenolic and naphtholic intermediates of various pesticides. The dialyzed crude enzyme was purified by ion-exchange column chromatography with diethylaminoethyl- cellulose, followed by gel filtration with Sephadex G-200. The enzyme, a phenol oxidase, was capable of polymerizing 2-chlorophenol, 4-chlorophenol, 2,4-dichlorophenol, and 4-bromo-2-chlorophenol. 1-Naphthol, 2-naphthol, and some of their derivatives formed oligomers or polymers when incubated with the enzyme, but 4-nitrophenol and 2,4-dinitrophenol were not oxidized. Chlorinated and brominated anilines, which are derivatives of herbicides, were not altered by the phenol oxidase from *R. praticola*, but 4-methoxyaniline was transformed by the enzyme to 2-amino -5- *p*-anisidinobenzoquinone -di-*p*-methoxyphenylimine. The formation of polymeric products were determined by mass spectrometric analysis. (Author abstract by permission)

77-1741. Shtenberg, A. I.; Torchinskii, A. M. (Lab. Toxicol. Pestic., Inst. Nutr., Acad. Med. Sci. USSR, Moscow, USSR). **K voprosy ob adaptatsii k deistviyu nekotorykh teratogenov vsledstvie predvaritel'nogo vvedeniya samke pestitsidov.** [**Adaptation to the effects of some teratogens by prior administration of pesticides to female rats.**] *Byull. Eksper. Biol. Med.* 83(2): 227-228; 1977. (8 references) (Russian)

The effects of DDT and lindane on the teratogenic action of sodium acetylsalicylate and benomyl, a carbamate pesticide, were investigated on Wistar rats. The pesticides were administered to the rats beginning from the onset of pregnancy, and the test teratogens were given on days 10 and 12 of gestation. Prior administration of the pesticides reduced the teratogenic and embryotoxic effects of benomyl at 250 mg/kg and sodium acetylsalicylate at 400 mg/kg. When sodium acetylsalicylate was given at 600 mg/kg prior administration of pesticides decreased the postimplantation embryonic mortality, but the number of fetuses with developmental anomalies was identical to that when sodium acetylsalicylate was given alone.

77-1742. Schuphan, I.; Ebing, W. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanst. Land-Forstwirtsch., Berlin, Germany). **Zum Metabolismus von Thiocarbamat-Herbiziden. I. Zur chemischen Umwandlung des Herbizides Diallat und Synthese moeglicher Diallat-Metaboliten.** [**Metabolism of thiocarbamate herbicides. I. Chemical transformation of diallate and synthesis of possible diallate metabolites.**] *Chemosphere* 6(4): 173-178; 1977. (5 references) (German)

It has been proposed that metabolism of diallate in soil and plants proceeds via hydrolysis and that the fragments may still contain the intact dichloroallyl group. Diallate isomers were found to be highly stable under acid hydrolysis conditions and the thiocarbamate structure was

also resistant toward acidic oxidative conditions; isomerization did not occur. Isomerization of 3-bromo-1,2-dichloropropene on the other hand begins at room temperature. The *trans*-form of diallate disappears more rapidly than the *cis*-form upon standing at room temperature in alkaline solution containing a little acetone. No degradation products could be detected by GLC-ECD. In an alkaline medium containing methanol a stable addition product of methanol to the double bond was found in which a chlorine atom had been replaced by a methoxy group, along with an addition product of methanol to the double bond, as demonstrated by mass spectrometry. Thus attack at the double bond may represent an important initial step in degradation, leading to formation of polar metabolites which retain the thiocarbamate structure. Formation of the anticipated dichloropropenethiol and dichloropropenol was not demonstrated in any of the in vitro experiments to date. However, they were synthesized for use in subsequent biodegradation studies.

77-1743. Addison, R. F.; Zinck, M. E.; Willis, D. E. (Dep. Environ., Fish. Mar. Serv., Marine Ecol. Lab., Beford Inst. Oceanogr., Dartmouth, Nova Scotia, B2Y 4A2, Canada). **Mixed function oxidase enzymes in trout (*Salvelinus fontinalis*) liver: absence of induction following feeding of *p,p'*-DDT or *p,p'*-DDE.** *Comp. Biochem. Physiol.* 57(1): 39-43; 1977. (22 references)

The characteristics of aldrin epoxidase, 7-ethoxycoumarin *O*-de-ethylase, and cytochrome P-450 (components of a mixed function oxidase system) in trout (*Salvelnus fontinalis*) liver are described. Feeding of *p,p'*-DDT or *p,p'*-DDE to trout over a 4 week period to produce tissue concentrations of around 20 and 60 ppm wet wt respectively, did not induce the activities of any of the enzymes listed above, of aniline hydroxylase, nor of microsomal protein levels above those occurring in trout not exposed to those compounds. (Author abstract by permission)

77-1744. Declume, C.; Derache, M. (INSERM Unit 87, Univ. Paul-Sabatier, Toulouse, France). **Biodisponibilite du ^{14}C-carbaryl apres administration oral a la ratte gestante. [Bioavailability of ^{14}C-carbaryl after oral administration to the pregnant rat.]** *C. R. Acad. Sci. Paris Ser. D* 283(16): 1799-1801; 1976. (11 references) (French)

A single-dose oral administration of the cholinesterase inhibitor ^{14}C-carbaryl was given on day 18 of pregnancy in Sprague-Dawley rats, and the animals were killed 1, 5, 8, 24, 48, 72, and 96 hr after treatment. Principal maternal organs and the fetus were analyzed for ^{14}C content. Intestinal passage of the ^{14}C-methyl labeled moiety was rapid. Maximal activity was found in blood, liver, and kidney 1 hr after administration. The maximum activity in the brain, was found after 96 hr and was always far low than the activity in the blood. Carbaryl metabolites passed rapidly through the placental barrier; levels in the whole placenta and fetus always exceeded those in the maternal blood. The levels of activity in the fetus continued to increase throughout the observation period; thus the fetus appeared to serve as a sink for residues.

77-1745. Didier, R. (Lab. Biol. Animale, Aubiere, France). **Etude sur la caille des effets toxiques de l'acide 2,4,5-trichlorophenoxyacetique. [Study of the toxic effects of 2,4,5-T in the quail.]** *C. R. Acad. Sci. Paris Ser. D* 284(10): 847-850; 1977. (12 references) (French)

Laboratory reared Gerardmer quail were treated with the amyl ester of 2,4,5-T, either in a single dose of 300 mg/kg by intraperitoneal injection in 4-week-old birds or by intraperitoneal injection at 100 mg/kg/day for 5 days during week 11 and similar doses orally during week 14. No clinical signs of intoxication were apparent; however, a 16% mortality rate was seen following administration of the repeated oral doses. No changes in weight gain were seen. The treated birds laid fewer eggs than the controls (5.9 vs. 6.8 per week), and their egg laying rhythm was irregular. A temporary decline in egg weight occurred following treatment; the fertilization rate was not affected. Organs examined appeared normal aside from or a congested appearance, except for the liver, which showed signs of severe toxic degeneration.

77-1746. David, D. (Lab. Biol. Anim., Univ. Clermont-Ferrand, Aubiere, France). **Influence du DDT sur la population germinale gonadique d'embryons de Caille de cinq generations successives. [Effect of DDT on the gonadal germ cell population of quail embryos in five successive generations.]** *C. R. Acad. Sci. Paris Ser. D* 284(11): 949-952; 1977. (7 references) (French)

Eggs from Japanese quail, Geromoise strain, were immersed for 30 sec prior to incubation in 0.5% aqueous suspension of 50% commercial DDT. Germ cell populations were examined in the offspring for up to five generations, with or without additional DDT treatment of eggs in succeeding generations. DDT treatment significantly reduced the germ cell counts in the five-day-old treated embryos; this effect persisted to some extent in the offspring of this population without further DDT treatment, and dropped practically to nil by the third generation. Upon retreatment of the eggs from the offspring the germ cell deficit was continued but not aggravated. The rate of fertilized egg production by the successive treated generation showed little or no reduction compared to the controls, which might be due to the fact that the germs cells remaining were sufficient for egg production or that they multipled more rapidly than usual. Some adaptation of the embryos of the fifth treatment generation to the effects of DDT was apparent. Abnormal mitotic patterns were noted in some of the dividing germ cells, but the number of cell divisions was apparently unchanged.

77-1747. Dura, G.; Desi, I.; Tanka, D.; Szabo, Z. (Nat. Inst. Pub. Health, Budapest, Hungary). **Elektromiografias**

es enzimhisztokemiai viszgalatok lindan expozicio utan. [Electromyographic and enzyme histochemical studies following lindane exposure.] *Egeszsegtudomany* 21(1): 80-87; 1977. (13 references) (Hungarian)

Further studies on the toxic effects of lindane, a well known organochlorine pesticide, are presented. Rats were treated in a subacute experiment with lindane at 1/40-1/2 LD50, and in an acute experiment with a dose approximately equaling the LD50. Electromyographic examinations indicated an increased rate of polyphasic motor unit potentials. These changes in pattern were related to disturbances of impulse formation within the motor unit. The increased excitation accompanying acute intoxication was evidenced by the increased motor unit potential frequency, registered in different functional states of the muscles. No changes were demonstrated by hematoxylin-eosin staining in the internal organs of the animals following subacute treatment. However, the enzyme tests indicated lesions in the livers of treated animals. These data suggest a necessity for restrictive measures on the use of chlorinated hydrocarbons.

77-1748. Surjan, A.; Borzsonyi, M.; Nadasdi, L.; Pinter, A.; Csik, M. (Nat. Inst. Pub. Health, Budapest, Hungary). **Carcinogen *N*-nitrozo vegyuletek keletkezese carbendazim es dodin peszticidekbol. [Formation of carcinogenic *N*-nitroso compounds from carbendazim and dodine fungicides.]** *Egeszsegtudomany* 21(1): 69-75; 1977. (28 references) (Hungarian)

The nitrosation of the fungicides carbendazim and dodine was investigated in vitro. Formation of *N*-nitroso compounds was demonstrated in both cases with Griess reagent and infrared spectroscopy; however, the exact structural formula was not determined. When carbendazim was administered intragastrically and water containing sodium nitrite was supplied 33% of the adult animals developed lymphosarcoma. Malignant lymphosarcoma developed at a frequency of 53.8% in offspring of animals treated during gestation. Malignant tumors developed in 60-90% of Swiss mice (dams and pups) treated intragastrically during gestation with different doses of dodine and supplied with water containing sodium nitrite. Neither carbendazim nor dodine was tumorigenic alone.

77-1749. Spetale, M. R.; Morisoli, L. S.; Rodriguez Garay, E. A. (Inst. Fisiol., Fac. Cienc. Med., Univ. Nacional de Rosario, Rosario, Argentina). **The effect of organophosphorus compounds on respiration by rat liver mitochondria.** *Farmaco Ed. Sci.* 32(2): 116-122; 1977. (9 references)

Rat liver mitochondria prepared by the standard methods were examined in the presence of three organophosphorus compounds, parathion, malathion, and dimethoate. Oxygen uptake and respiratory control ratio were measured polarographically. The addition of pesticides to the reaction vessel containing normal mitochondria or pretreatment of the rats with these compounds prior to sacrifice decreased state 3, state 4, and 2,4-dinitrophenol stimulated respiration with glutamate-malate as substrate in the presence of malonate. The states mentioned were not significantly altered when succinate was used as substrate. In the presence of the pesticides the respiratory control ratio decreased with both substrates. The results obtained regarding mitochondrial respiration in vivo and in vitro suggest that the three organophosphorus compounds mentioned behave as inhibitors of the mitochondrial electron transport system. Decreases in the respiratory control ratio may be related to a change in the permeability of the inner mitochondrial membrane.

77-1750. Baker, D. H. (Dep. Anim. Sci., Univ. Illinois, Urbana, IL 61801). **Environmental contaminants and their nutritional impact. Introduction.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(6): 1079; 1977.

A symposium on environmental contaminants and their nutritional impact was conducted as part of the 41st annual poultry nutrition conference presented by the American Institute of Nutrition at the 60th Annual Meeting of the Federation of American Societies of Experimental Biology, Apr. 11, 1976, in Anaheim, California. Past reports had made it apparent that meat-producing animals as well as man are exposed to a variety of potentially dangerous chemicals; the poultry industry is particularly susceptible to pollution because it is highly concentrated. Some problems of environmental contamination and their solution were discussed at the symposium.

77-1751. Naber, E. C. (Dep. Poultry Sci., Ohio State Univ., Columbus, OH 43210). **The impact of contamination by organochlorine insecticides on poultry nutrition and feeding.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(6): 1880-1887; 1977. (69 references)

Nutrient interactions with organochlorine insecticides have been described primarily for vitamin A and protein. Storage of liver vitamin A is reduced by DDT and dieldrin. Low protein diets protect rats from heptachlor toxicity, whereas the toxicity of DDT, dieldrin and lindane is reduced by increasing the quantity and quality of dietary protein intake. Biological performance of poultry is adversely affected by 50 to 500 ppm of most of these compounds. Hatchability of eggs and survival of chicks from hens fed insecticides are usually the most sensitive parameters of toxicity. Higher levels of DDT decrease thyroid activity. While several insecticides reduce egg shell thickness in wild birds, such changes are not observed in poultry. Extensive low level contamination of poultry tissues and eggs results from the use of the organochlorine insecticides, with the exception of methoxychlor, where tissue residues are not a problem. Tissue and egg accumulation of residues is related to dose but quantitatively different for each organochlorine compound. Tissue withdrawal and excretion takes place slowly and most of the compounds are metabolized by liver hydroxylating enzymes to various derivatives that

are also stored in the body. In one case (heptachlor epoxide), the oxidation product is more toxic than the parent compound. (Author abstract by permission)

77-1752. Scott, M. L. (Dep. Poultry Sci., Cornell Univ., Ithaca, NY 14853). **Effects of PCBs, DDT, and mercury compounds in chickens and Japanese quail.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(6): 1888-1893; 1977. (9 references)

In well-controlled experiments using white leghorn chickens and Japanese quail, dietary polychlorinated biphyenyls (PCBs), DDT and related compounds produced no detrimental effects on eggshell quality. A drastic reduction in hatchability of chicks occurred with 10-20 ppm PCBs, but no detrimental effects on eggshell quality, egg production or hatachability were found with 0.5 and 1.0 ppm PCBs, or DDT up to 100 ppm. Dietary PCBs potentiated a vitamin E-selenium deficiency in the chick, increased exudative diathesis, and decreased plasma glutathione peroxidase levels. Dietary PCBs induced hepatic microsomal benzpyrene hydroxylase. Dietary levels of 100 or 200 ppm inorganic mercury as $HgSO_4$ or $HgCl_2$ had little effect on egg production, hatchability, shell quality, morbidity and mortality. Methylmercury chloride, however, at levels providing 10 or 20 mg Hg/kg of diet, severely affected all of these parameters. Even though the present experiments demonstrate that neither DDT nor PCBs has any effect on eggshell quality in chickens and Japanese quail, they may cause thinning of eggshells in other species. Controlled experiments are lacking. Eagles, ospreys and pelicans all consume fish which in many areas of the world are known to contain methyl mercury. The thinning of eggshells in these species in the wild may have been due, at least in part, to environmental contamination with methylmercury rather than DDT, DDE or PCBs, as has been claimed. (Author abstract by permission)

77-1753. Trepanier, G.; Marchessault, F.; Bansal, J.; Chagnon, A. (Inst. Armand-Frappier, Laval-des-Rapides, Quebec, Canada H7N 4Z3). **Cytological effects of insecticides on a human lymphoblastoid cell line.** *In Vitro* 13(3): 201; 1977.

The cytological effects of guthion (azinphosmethyl) and dieldrin were examined on an established cell line (L-Moore) of human lymphocytoid origin. Log phase cell cultures were treated with LD50 amounts of the insecticides, 60 μg/ml for guthion and 12.5 μg/ml of dieldrin. Dieldrin was more toxic to the cultured cells than was guthion. High frequencies of chromatid breaks and exchanges were observed in both cases. Other types of chromosome anomalies, e.g., despiralization and pulverization, were seen less frequently. The occurrence of chromatid type breaks at high frequencies indicated that these aberrations develop after the G1 phase of the cell cycle. The cells may exhibit differential sensitivity to the insecticides during the different phases of the cell cycle.

77-1754. Anderson, B. M.; Noble, C., Jr.; Gregory, E. M. (Dep. Biochem. Nutr., Virginia Polytech. Inst. State Univ. Blacksburg, VA 24061). **Kepone inhibition of malate dehydrogenases.** *J. Agric. Food Chem.* 25(3): 485-489; 1977. (15 references)

Malate dehydrogenase catalyzed reactions, both the oxidation of malate and the reduction of oxalacetate, are effectively inhibited by the polychlorinated hydrocarbon pesticide, Kepone (chlordecone). Mixed inhibition with respect to substrates and coenzymes was observed in reactions catalyzed by bovine mitochondrial malate dehydrogenase, porcine mitochondrial malate dehydrogenase, and porcine cytoplasmic malate dehydrogenase. With the bovine enzyme, the Kepone inhibition was shown to be reversible upon dilution, better at pH 7.4 than at pH 9.0, and not to involve a time-dependent inactivation process. At concentrations inhibitory to the bovine enzyme, Kepone induces an accelerated rate of inactivation of this enzyme by *N*-ethylmaleimide, suggesting the possible importance of an unfolding or dissociation process in the inhibition by Kepone. The fully chlorinated pesticide, mirex, was also shown to be inhibitory and to facilitate *N*-ethylmaleimide inactivation of bovine mitochondrial malate dehydrogenase. (Author abstract reprinted by permission of the American Chemical Society)

77-1755. Miaullis, J. B.; Hoffman, L. J.; DeBaun, J. R.; Menn, J. J. (Biochem. Dep. Stauffer Chem. Co., Mountain View Res. Ctr., Mountain View, CA 94042). **Metabolism of *O*-ethyl *S*-4-chlorophenyl ethanephosphonodithioate (N-2596) in the rat.** *J. Agric. Food Chem.* 25(3): 501-506; 1977. (13 references)

The experimental insecticide, *O*-ethyl *S*-4-chloro [U-^{14}C] phenyl ethanephosphonodithioate ([^{14}C]N-2596), is rapidly metabolized to detoxification products in rats receiving a single oral dose of [^{14}C]N-2596. Within 4 days of administration, the radiocarbon had been excreted mostly in the urine as conjugates of 4-chloro-3- hydroxyphenyl methyl sulfone. The primary metabolic biotransformations arise from scission of either N-2596 or its oxygen analogue to yield 4-chlorothiophenol which is then *S*-methylated, sulfoxidized, and ring hydroxylated. Neither N-2596 nor its oxygen analogue were detected in the urine of treated rats. Tissue residues based on total ^{14}C analysis decreased rapidly to negligible levels during an 8-day holding period. (Author abstract reprinted by permission of the American Chemical Society)

77-1756. Gorbach, S. G.; Kuenzler, K.; Asshauser, J. (Anal. Lab., Hoechst Aktiengesellschaft, 6230 Frankfurt/Main 80, Germany). **On the metabolism of Hoe 23408 in wheat.** *J. Agric. Food Chem.* 25(3): 507-511; 1977. (3 references)

Summer wheat was treated with ^{14}C-labeled Hoe 23408 OH, methyl 2-[4-(2',4'-dichlorophenoxy)-phenoxy-^{14}C propionate, at a rate of 1 kg/ha. After an 18-day waiting period 3% of the radioactivity present was

on the plant surface, 58% could be extracted with organic solvents, 32% could be extracted after alkaline digestion, and 0.6% remained unextracted. The main metabolites were identified as 2-[4-(2′,4′-dichlorophenoxy) phenoxy] propionic acid, 2-[4-(2′,4′-dichloro-5- hydorxyphenoxy) phenoxy] propionic acid, and the two possible isomers in respect to the hydroxy substitutent, the 3′-hydroxy and 6′-hydroxy derivatives present in the plant as conjugates. (Author abstract reprinted by permission of the American Chemical Society)

77-1757. Lamorurex, G. L.; Stafford, L. E. (U.S. Dep. Agric. Metab. Radiation Res. Lab., Fargo, ND 58102). **Translocation and metabolism of perfluidone (1,1,1-trifluoro-*N*- (2-methyl-4- (phenylsulfonyl) phenyl) methanesulfonamide) in peanuts.** *J. Agric. Food Chem.* 25(3): 512-517; 1977. (9 references)

[^{14}C]Perfluidone was slowly absorbed by the roots of peanuts grown in nutrient solution containing 0.5 to 5 μM [^{14}C]perfluidone, and from 22.4 to 41.2% of the absorbed ^{14}C was translocated to the shoots. Slight injury to the roots was observed with peanuts treated with 5 μM [^{14}C]perfluidone. [^{14}C]Perfluidone was the only radioactive product detected in the initial chloroform extracts from any of the treated tissues. In excised peanut leaves, the β-*O*-D-glucoside of 1,1,1-trifluoro- *N*-[4-[(3-hydroxyphenyl) sulfonyl]-2- methylphenyl methanesulfonamide and products that liberated [^{14}C]perfluidone upon mild acid treatment were the major water-soluble metabolites present. These products were present in much lower concentrations in intact seedlings where the treatment period was longer. Unidentified aqueous 80% methanol-soluble products (37.4%) and aqueous 80% methanol-insoluble products (41.9%) were the major radioactive components in seedlings harvested 22 days after treatment. Seedlings treated with [^{14}C]perfluidone did not evolve an experimentally significant amount of $^{14}CO_2$. (Author abstract reprinted by permission of the American Chemical Society)

77-1758. Sanborn, J. R.; Childers, W. F.; Hansen, L. G. (Illinois Natural History Survey, Univ. Illinois, Urbana, IL 61801). **Uptake and elimination of ^{14}-hexachlorobenzene (HCB) by the green sunfish, *Lepomis cyanellus* Raf., after feeding contaminated food.** *J. Agric. Food Chem.* 25(3): 55-553; 1977. (15 references)

The feeding of [^{14}C]hexachlorobenzene (HCB) contaminated food to green sunfish at 1, 10, and 100 ppm resulted in residues which were related to the concentration in the food. The highest residues were in the alimentary tract of the fish and the lowest residues in the skeletal muscle. The majority of the ^{14}C residue in all tissue in all tissues consisted of HCB and pentachlorophenol (PCP). The ratio of HCB/PCP in all tissues, except the skeletal muscle, decreased during the course of the experiment. For the skeletal muscle the ratio of HCB/PCP increased to a value of 4.30. The apparent half-life values for elimination of the HCB, PCP, and total ^{14}C between days 14 and 28 after feeding ranged from a low of 8.0 days for elimination of HCB from the stomach-pyloric caeca to 16.6 days for elimination of PCP from the same organ. Several weeks would be required to eliminate residues accumulated from 3-day exposure, but the edible portion would clear most rapidly and contain fewer metabolites. (Author abstract reprinted by permission of the American Chemical Society)

77-1759. Olson, L. E.; Allen, J. L.; Hogan, J. W. (U. S. Dep. Interior Fish Wildl Serv., Fish Pestic. Res. Unit, La Crosse, WI 54601). **Biotransformation and elimination of the herbicide dinitramine in carp.** *J. Agric. Food Chem.* 25(3): 554-556; 1977. (7 references)

Carp (*Cyprinus carpio*) exposed to 1 mg/L of dinitramine (N_3,N_3-diethyl- 2,4-dinitro -6-trifluoro- methyl-*m*-phenylenediamine) for 12 h accumulated the herbicide. After the fish were held in fresh water for 7 days, samples of plasma, muscle, and gallbladder bile contained 6, 25, and 7%, respectively, of the concentration found immediately after exposure. Metabolites were not found in plasma or muscle, but deethylated dinitramine was present in gallbladder bile; biotransformation by dealkylation thus occurred in the liver. (Author abstract reprinted by permission of the American Chemical Society)

77-1760. Baker, P. B.; Woods, D. R. (Microbiol. Dept., Rhodes Univ., Grahamstown, South Africa). **Co-metabolism of the ixodicide amitraz.** *J. Appl. Bacteriol.* 42(2): 187-196; 1977. (14 references)

A study was conduted to determine the nature and extent of bacterial involvement in the degradation of amitraz in dip tanks. Bacteria capable of degrading the ixodicide amitraz were isolated from cattle dipping tanks by the enrichment culture technique. The conditions for amitraz degradation were characterized and the bacteria identified as *Pseudomonas* and *Achromobacter* spp. The bacteria degraded amitraz without using the ixodicide as a substrate or energy source. The degradation of amitraz by bacteria is an example of co-metabolism, with yeast extract or an ingredient of yeast extract acting as the co-metabolite. Bacteria were unable to degrade amitraz at pH greater than 11.5. Although bacteria can degrade amitraz, it is giving excellent tick control under practical field conditions. It is suggested, however, that the dip tank could provide a model system for the study of a co-metabolism in a natural environment.

77-1761. Owens, I. S. (Develop. Pharmacol. Br., Natl. Inst. Child Health Human Develop., Bethesda, MD 20014). **Genetic regulation of UDP-glucuronosyltransferase induction by polycyclic aromatic compounds in mice. Co-segregation with aryl hydrocarbon (benzo(α)pyrene) hydroxylase induction.** *J. Biol. Chem.* 252(9): 2827-2833; 1977. (39 references)

Induction of hepatic 4-methylumbelliferone UDP-glucuronosyltransferase (EC 2.4.1.17) by polycyclic aromatic compounds, such as 3-methylcholanthrene or β-naphthoflavone, occurs in C57BL/6N, A/J, PL/J, C3HeB/FeJ, and BALB/cJ but not in DBA/2N, AU/SsJ, AKR/J, or RF/J inbred strains of mice. This pattern of five responsive and five nonresponsive mouse strains parallels that of the *Ah* locus, which controls the induction of aryl hydrocarbon (benzo[*a*]pyrene) hydroxylase (EC 1.14.14.2). Induction of the transferase is maximal in C57BL/6N mice with 200 mg of 3-methylcholanthrene/kg body weight; no induction occurs in nonresponsive DBA/2N mice even at a dose of 400 mg/kg. The rise of inducible transferase activity lags 1 or more days behind the rise of inducible hydroxylase activity and peaks 5 days after a single dose of 3-methylcholanthrene. These data indicate that (a) the inducibility of two metabolically coordinated membrane-bound enzyme activities may be regulated by a single genetic locus, and (b) although the hydroxylase can be fully induced in the nonresponsive DBA/2N strain by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin prior to 3-methylcholanthrene treatment, metabolites of the 3-methylcholanthrene, presumably present in the liver, are incapable of inducing further the transferase activity. The difference in sensitivity between 3-methylcholanthrene and the more potent inducer 2,3,7,8-tetrachlorodibenzo-*p*-dioxin for both the hydroxylase and the transferase activities suggests the possibility of a common receptor in regulating both enzyme induction processes. (Author abstract by permission, abridged)

77-1762. Johnson, E. F.; Muller-Eberhard, U. (Dep. Biochem., Scripps Clin. Res. Fdn., La Jolla, CA 92037). **Resolution of two forms of cytochrome P-450 from liver microsomes of rabbits treated with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *J. Biol. Chem.* 252(9): 2839-2845; 1977. (30 references)

Two forms of cytochrome P-450 with different substrate specificities were isolated from liver microsomes of rabbits treated with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). A specific antibody was produced toward the major form of the cytochrome. The antibody inhibits microsomal acetanilide hydroxylation (80%). It does not cross-react with the minor fraction of the cytochrome or inhibit the hydroxylation of 3,4-benzpyrene or coumarin, the *N*-demethylation of aminopyrine or the *O*-deethylation of 7-ethoxycoumarin catalyzed by rabbit liver microsomes. The major form has an estimated M = 54,000 and displays an *n*-octalamine difference spectrum with an absorption maximum at 426 nm and a minimum at 391 nm. When reconstituted, this cytochrome catalyzes acetanilide hydroxylation at a higher rate than microsomes or the minor fraction. The *n*-octylamine difference spectrum of the minor fraction displays an absorption maximum at 431 nm and a minimum at 410 nm. When reconstituted, this fraction catalyzes the hydroxylation of 3,4-benzpyrene and the *O*-deethylation of 7-ethoxycoumarin. The two cytochromes appear to be distinct entities and function in different catalytic pathways. (Author abstract by permission)

77-1763. Krishnakumari, M. K. (Infest. Contr. Pestic., Ctr. Food Technol. Res. Inst., Mysore 570013, India). **Sensitivity of the alga *Scenedesmus acutus* to some pesticides.** *Life Sci.* 20(9): 1525-1532; 1977. (15 references)

Indoor cultures of the green alga *Scenedesmus acutus* were tested for sensitivity to varying concentrations of seven insecticides and three fungicides. The growth rates of the organisms were considerably reduced by BHC and DDT analogues even at low concentrations of 500 ppb and 1 ppm. Lindane above 5 ppm and technical BHC and DDT at 100 ppm were lethal to this alga. Of the three fungicides, thiram (TMTD, tetramethyl thiuram disulfide) was most toxic, resulting in death of the culture at 10 and 100 ppm. Blitox (copper oxychloride) and zineb (zinc ethylene bis dithiocarbamte) considerably retarded growth at all concentrations. This alga was more sensitive to lindane, BHC (technical), DDT, and TMTD. The growth rate appeared to be influenced by the concentration of pesticide present in the algal culture. As *Scenedesmus acutus* is being considered as a source of single cell protein (SCP) for human consumption, knowledge on the sensitivity of this alga to pesticide contamination will be useful. (Author abstract by permission)

77-1764. Sguros, P. L. (Dep. Biol. Sci., Florida Atlantic Univ., Boca Raton, FL). **Aspects of carbon metabolism in filamentous marine fungi: microbial degradation of cyclodiene pesticides.** *Natl. Tech. Inform. Serv.* AD-A022,474, 1976, 20 p.

A nutritional screening of 117 carbon and/or nitrogen sources against marine fungal cultures revealed poor acceptance of any compound as both C and N source, broad flexibility in accepting nitrogen sources, and a very narrow restriction of C sources to a few cellulose-associated carbohydrates. Oxidation dissimilation of glucose resulted in almost total conversion of cell substance and carbon dioxide. The cellulase complex was found to consist of three inducible agents: hydrocellulase, glucanase and cellobiose. Cellobiose was a strong inducer of cellulase. Application of whole cells and partially purified enzyme to various forms of waste cellulose was successful. Studies on microbial degradation of the cyclodiene pesticides aldrin and dieldrin were undertaken with marine fungi, a terrestrial bacterium, and bacteria from littoral, estuarine, and riverine stations. Only *Zalerion xylestrix*, of the marine fungi screened, was able to tolerate the cyclodienes. Strains of the soil corynebacterium *Arthrobacter oxydans* epoxidized aldrin to dieldrin, and some produced other metabolites as well. Asporogenous Gram-negative rods, many of which were classified as pseudomonads, were the predominant producers of degradation metabolites. (Author abstract by permission)

77-1765. Lembi, C. A.; Coleridge, S. E. (Water Resour. Res. Ctr., Purdue Univ., Lafayette, IN). **Selective toxicity of detergents and herbicides to phytoplankton.** *Natl. Tech. Inform. Serv.* PB-250,497, 1975, 81 p.

The current trend to remove phosphorus from detergents has resulted in the replacement of phosphate-based products with inadequately tested carbonate-based detergents. Additional studies were conducted on the effects of the phenoxy herbicides 2,4-D and silvex on phytoplankton. Carbonate detergents at low concentrations stimulated diatom growth. At higher carbonate concentrations the increased alkalinity favored bluegreen algae over the diatoms. In comparing phytoplankton cultures treated with carbonate and phosphate detergents, the carbonate products caused the least growth reduction to bluegreen algae and were more toxic to diatoms at lower concentrations. Diatoms were not affected by silvex acid at 140 ppm; however, planktonic green algae were affected at concentrations as low as 35 ppm. Neither herbicide, however, caused complete mortality, even at highest concentrations. (Author abstract by permission)

77-1766. Shannon, L. R. (Iowa Coop. Fish Unit, Ames, IA). **Accumulation and elimination of dieldrin by channel catfish (*Ictalurus punctatus*).** *Natl. Tech. Inform. Serv.* PB-251,168, 1974, 91 p.

Dieldrin accumulation and elimination by channel catfish after exposure to dieldrin in water and food were studied in the laboratory. When 4-14 inch catfish were immersed six hours in a solution containing 18.8 ppb dieldrin, the highest uptake was in the dorsal muscle of 7-10 inch fish. Dieldrin elimination was slowest in 12-14 inch fish. When 6-9 and 14-16 inch fish were exposed to 75 ppt dieldrin for 28 days, larger catfish accumulated more dieldrin than smaller fish. After elimination for 28 days, dieldrin levels in both groups were about equal. Balance between uptake and excretion occurred in 56 days in muscles of six inch catfish exposed to 13 ppt dieldrin, and muscles exposed to 27 ppt were approaching balance. After elimination for 28 days, dieldrin levels were not significantly different in muscles of 6-9 inch and 14-16 inch catfish exposed to dieldrin in both food and water. (Author abstract by permission)

77-1767. Crowder, L. A. (Dep. Entomol., Arizona Univ., Tucson, AZ). **Mode of action of cyclodiene insectidies.** *Natl. Tech. Inform. Serv.* PB-251,670, 1976, 87 p.

The report contains information concerning the mode of action, excretion, and metabolism of the cyclodiene insecticides. Toxaphene was the primary candidate for investigation with major emphasis on the mammalian system. Excretion of 36Cl-toxaphene was studied in the laboratory rat. Upon extraction, most of the radioactivity occurred in the water fractions of urine and feces as ionic chloride, indicating considerable metabolism of toxaphene. Occurrence of radioactivity in several tissues of *Leucophaea maderae* was determined after injections of 36Cl-toxaphene. Uptake of .00001M 36Cl-toxaphene in subcellular particles of ventral nerve cord and brain was studied and showed significant levels in the larger cell fragments. The toxicity syndrome of toxaphene to *Gambusia affinis* was divided into five stages, and the residue level at each stage was determined. Excretion was not observed. Metabolic alteration of toxaphene appeared to be minimal. Ventral nerve cords of *Periplaneta americana* and *L. maderae* showed increased nerve activity as viewed electrophysiologically when exposed to toxaphene. Toxaphene appeared to be a neurotoxicant. (Author abstract by permission)

77-1768. Metcalf, R. L. (Dep. Entomol., Univ. Illinois, Urbana-Champaign, IL). **Role of mixed function oxidases in insecticide action.** *Natl. Tech. Inform. Serv.* PB-251,709, 1976, 42 p.

The role of the microsomal oxidase enzymes (MFO) in the biochemistry and toxicology of insecticides has been studied. Insects contain greatly varying titres of these enzymes. A survey of 74 species from 40 families in 8 orders, using the topical LD50 of carbaryl alone and together with the inhibitor piperonyl butoxide showed a 55,000-fold variability in LD50 largely due to MFO detoxication. In individual species of Diptera, MFO activity is highly variable with age, sex, and stage of development. The DDT-type molecule has been used as a model for the study of degradophores, i.e. molecule groupings that can serve as MFO substrates. Their oxidation thus converts lipophilic compounds into more water-partitioning moieties and thus promotes excretion rather than lipid storage. Suitable degradophores for the DDT-type molecule are alkyl and alkoxy groups on the aryl rings. Compounds with judicious combinations of these provide relatively long persistence on inert surfaces and ready biodegradability in vivo. Such compounds are much less toxic to mice and to fish than DDT but because of the generally lower MFO of insects, can be effective insecticides. The role of degradophores incorporated into the aliphatic moiety of DDT has also been explored, where the -CH(CH3)2, -CHCH3Cl and -CHCH3NO2 groups are useful. Induction experiments with the biodegradable DDT analogues in mice has demonstrated that unlike DDT, these compounds do not elevate liver MFO. (Author abstract by permission)

77-1769. O'Kelley, J. C.; Deason, T. R. (Dep. Biol., Alabama Univ., University, AL). **Degradation of pesticides by algae.** *Natl. Tech. Inform. Serv.* PB-251,933, 1976, 51 p.

In the investigation interactions of 12 pesticides with 37 strains of fresh water algae were studied in an effort to determine something of the variability in responses of fresh water algae to the variety of pesticides in use or projected to be used in the future. Three interactions were investigated. One was the toxicity of the pesticides to these algae. Another was the sorption of several of the

pesticides by some of the species of algae. The third was the possibility that some of the pesticides can be degraded by action of algae. In general it was found that sensitivity of algae to pesticides varied greatly with the strains tested. Sorption of methoxychlor appeared to be mainly physical, since much of the methoxychlor sorbed was exchangeable. The butoxyethyl ester of 2,4-D (2,4-DBE) was not sorbed to a significant extent by two green algae tested, and sorption of carbaryl was very slow. Malathion can be degraded by algae in the presence of light. One breakdown product, malathion monoacid (beta form), appeared as the malathion was being degraded, and later disappeared. (Author abstract by permission)

77-1770. Bookhout, C. G.; Costlow, J. D., Jr. (Marine Lab., Duke Univ., Beaufort, NC). **Effects of mirex, methoxychlor, and malathion on development of crabs.** *Natl. Tech. Inform. Serv.* PB-252,007, 1976, 96 p.

Laboratory experiments were conducted to determine the effects of mirex, methoxychlor and malathion on the larval development of *Callinectes sapidus* from the time of hatching until the first crab stage is reached. For comparison, similar investigations were made to ascertain the effects of methoxychlor and malathion on larval development of *Rhithropanopeus harrisii*. The effect of a range of concentrations of each insecticide on survival of larvae of *C. sapidus* and *R. harrisii* was determined, as well as concentrations which were sublethal and lethal. Zoeal and total development to the first crab stage of *R. harrisii* and *C. sapidus* was prolonged in relation to increased concentrations of methoxychlor and malathion observed abnormalities included abnormal development of the pleopods of male *R. harrisii* and male *C. sapidus* early crab stages, and autotomy of the legs of *R. harrisii* megalopa and early crab stages. The developmental stages in which larvae are particularly sensitive vary in the two species and with the three insecticides. (Author abstract by permission)

77-1771. Khattat, F. H.; Farley, S. (Hazleton Labs. Inc., Vienna, VA). **Acute toxicity of certain pesticides to *Acartia tonsa* Dana.** *Natl. Tech. Inform. Serv.* PB-252,673, 1976, 39 p.

The acute toxicity to the marine copepod *Acartia tonsa* Dana of four technical grade insecticides was determined by bioassay using standardized procedures, homogeneous populations and constant laboratory conditions. At a water temperature of 17 plus or minus 1°C, the 96-hour median lethal concentrations or tolerance limits for methyl parathion, Azodrin, diazinon and toxaphene were computed as 0.89 milligrams per liter, 0.24 milligrams per liter, 2.57 micrograms per liter and 7.2 nanograms per liter, respectively. Residue analysis for diazinon at zero and 96-hour exposure time revealed that the amounts of diazinon uptake by three algal organisms is greater than amounts concentrated by the copepod. The toxicity of higher concentrations above 2.0 ppm (2 milligrams per liter) has offset copepod uptake, while at lower concentrations, quantities concentrated by *Acartia* are negligible. (Author abstract by permission)

77-1772. Metcalf, R. L. (Illinois Univ., Urbana-Champaign, IL). **Evaluation of a laboratory microcosm for study of toxic substances in the environment.** *Natl. Tech. Inform. Serv.* PB-252,982, 1975, 72 p.

The final report, highlighting the results obtained, describes how a simple model ecosystem technology can yield, at modest expense, a wealth of valuable information about pesticides, drugs, plasticizers, industrial chemicals, carcinogens, and trace metals. The value of a laboratory microcosm lies in its use in prescreening new chemicals at an early stage in their development; developing environmentally congenial products; and tracing environmental fate and degradation pathways, toxicity, ecological magnification, biodegradability index and unextractable radioactivity. A bibliography containing published results, in research papers and technical reports, is included. (Author abstract by permission)

77-1773. Office of Toxic Substances (Environ. Protect. Ag., Washington, DC). **Summary tabulation of selected EPA activities concerning toxic chemicals.** *Natl. Tech. Inform. Serv.* PB-253,172, 1976, 19 p.

The tabulation in this Report summarizes EPA's current activities directed to related toxic chemicals, with emphasis on current and near-term regulatory activities. Also, appropriate published references are identified which should help the interested reader understand the details of the activities. (Author abstract by permission)

77-1774. Schuster, K. P.; Renner, G. (Pharmakol. Inst., Univ. Munchen, Munich, Germany). **Studies on the metabolism of hexachlorobenzene.** *Naunyn Schmiedebergs Arch. Pharmacol.* 297(suppl. 2): R5; 1977.

Male and female rats (200) were dosed with a total amount of 220 g hexachlorobenzene (300 mg/kg) in arachis oil during ten months. For determination of metabolites, the acidified urine was extracted with ether. Phenolic metabolites were separated from hexachlorobenzene and its chlorinated benzene metabolites by extracting the ether with diluted NaOH. These studies show pentachlorophenol and 2,4,5-trichlorophenol as urinary metabolites of hexachlorobenzene. They were isolated by means of silica gel TLC in various solvent systems and identified by *Rf* value, m.p., mixed m.p., UV-, IR-, NMR- and mass spectroscopy. By reverse phase thin layer chromatography of the chlorinated benzenes, 1,2,4,5-tetrachlorobenzene and other chlorobenzenes, at present not completely identified, could be detected. (Author abstract by permission) (Abstracts of the 18th Spring Meeting of the German Pharmacologic Society, Mainz, 1977, abstract no. 17.)

77-1775. Wolff, T. (Dep. Toxicol., Gesellsch. Strahlen-Umweltforsch., D-8042 Neuherberg, Germany). **Microsomal aldrin epoxidation, a facile and sensitive method for the determination of mixed-function oxidase activity.** *Naunyn Schmiedebergs Arch. Pharmacol.* 297(suppl. 2): R7; 1977.

The epoxidation of aldrin has been shown to be catalyzed by mixed-function oxidase(s) (J.W. Ray, *Biochem. Pharmacol.* 16: 99, (1967). In view of the high degree of chlorination of aldrin and its metabolite dieldrin gas chromatography offers a highly sensitive method to assay this reaction. A column packed with 3% XE-60 on Chromosorb W/AW/DMCS 80/100 mesh and a ^{63}Ni-EC-detector were used. Quantitation was achieved with an HP 338OA-integrator. A single hexane extract of the incubation mixture was sufficient for analysis. Under these conditions epoxidase activities between 10^{-8} and 10^{-11} mol/min/mg protein could be determined in the presence of 10^{-4} M aldrin. Thus, activities could be estimated in minute amounts (10 μg/ml) of hepatic microsomal protein or in microsomes from extrahepatic tissue with low activities. To explore which form of cytochrome P-450 is involved in the epoxidation the effects of pretreatment of rats with the inducers phenobarbital (PB) and methylcholanthrene (MC) in liver microsomes were determined. PB stimulated dieldrin formation 3-5fold, whereas MC did not have a stimulatory effect. The pattern of epoxidase activites was similar to that of ethylmorphine demethylase and was different from that of benzo(a)-pyrene hydroxylase. Thus, aldrin epoxidation appears to be more related to the forms of cytochrome P-450 than to those of cytochrome P-448. (Author abstract by permission) (Abstract no. 26)

77-1776. Niedner, R.; Oettingen, U. (Inst. Pharmakol. Toxikol., Tech. Univ., D-3300 Braunschweig, Germany). **Effects of herbicides and insecticides on acetylcholinesterase activity.** *Naunyn Schmiedebergs Arch. Pharmacol.* 297(suppl. 2): R16; 1977.

As pointed out in an earlier paper (Niedner and v. Oettingen, *Arch. Pharmacol.* Suppl. 294: R25, 1976) the herbicide chlorbufam activates the AChE in plasma of mice. An influence of this substance on the AChE activity of plasma, liver, and central nervous system (CNS), and a dose dependent increase of AChE activity was found in plasma, alone with a decrease in liver; no effect was seen on the CNS. The simultaneous application of chlorbufam and parathion led to a smaller inhibition of AChE than parathion given alone. According to this result an increase of AChE activity was found when the herbicide was applied after having poisoned mice with parathion. When both substances were given simultaneously in a daily dose of 2 mg parathion and 100 mg chlorbufam per kg b.w. over a period of one week the AChE activity decreased successively from day to day, but on a lower level in comparison with parathion alone. The combination of chlorbufam with paraoxon, compared with paraoxon alone showed no difference. When the fungicide cycloheximide instead of chlorbufam was fed together with parathion or paraoxon, AChE activity was more inhibited than when the insecticide was given alone. 2,4-D plus parathion fed for 4 days resulted in a higher AChE activity only on the first day. Thereafter this combination as well as parathion alone showed no difference. 2,4,5-T reacted in a biphasic manner. The first two days after the application of parathion and 2,4,5-T the AChE showed a higher, on the 3rd and 4th day a lower activity in comparison with parathion alone. (Author abstract by permission) (Abstract no. 63)

77-1777. Bertram, U.; Kasten, A.; Lohr, J. (Dep. Pharmacol., Univ. Kiel, D23 Kiel, Germany). **The protective and therapeutic potency of dexetimide in organophosphate posioning of rabbits and mice.** *Naunyn Schmiedebergs Arch. Pharmacol.* 297(suppl. 2): R19; 1977.

Experiments were carried out to investigate the protective and therapeutic effects of dexetimide (the dextro-isomer of benzetimide, a drug with strong central cholinolytic action(Janssen and Niemeggers, *Psychopharmacologia 11*, 231, 1967) in combination with an oxime reactivator concerning intoxications of mice and rabbits with organophosphates. The protective potency of dexetimide alone did not differ from that of atropine and scopolamine against an intoxication of mice by diisopropyl phosphorofluoridate (DFP). Marked differences could be demonstrated when these cholinolytics were combined with obidoxime. Protection factors (LD50 after pretreatment/LD50 control) amounted to 180 for the combinations of obidoxime with dexetimide and of obidoxime with scopolamine. Atropine plus obidoxime only yielded a factor of 25. In this experiment the cholinolytics were given in a dosage of 10 μmol/kg b.w. and obidoxime 100 μmol/kg b.w. Rabbits intoxicated with DFP and paraoxon could be treated successfully. In contrast an intoxication by OMPA (octamethylpyrophosphoramide, schradan) could not be influenced. When poisoned with 50 times the LD50 of paraoxon (i.v.), 60 times the LD50 of paraoxon (s.c.) or with 80 times the LD50 of DFP (s.c.) the animals survived, if dexetimide (20 μmol/kg b.w.) and obidoxime (20 μmol/kg b.w.) were given intravenously at the onset of the intoxication. The relative inefficacy of atropine might be caused by the minor availability of atropine in the central nervous system compared with that of dexetimide or of scopolamine. It is suggested to use in the treatment of organophosphate intoxication cholinolytics which readily penetrate the blood-brain barrier. (Author abstract by permission) (Abstract no. 74)

77-1778. Lameijer, W. (Dep. Pharm., Div. Pharmacother., Univ. Amsterdam, Amsterdam, The Netherlands). **Influence of iduretic treatment on thallium excretion.** *Naunyn Schmiedebergs Arch. Pharmacol.* 297(suppl. 2): R19; 1977.

Prussian blue is assumed to be the preferred treatment of thallotoxicosis. The entero-enteral cycle of thallium is interrupted, due to the exchange between thallium and the iron from the crystal lattice of potassium fer-

ricyano ferrate (II). This treatment is limited for various reasons, especially when thallium has provoked paralysis of the small intestine. Since a more rapidly proceeding treatment of thallotoxicosis would be desirable, the possibility of accelerating the renal excretion of thallium by means of drug-induced enhanced diuresis was investigated. In earlier studies it was shown that in rats chronically treated with thallium this metal accumulates in the kidney, whereas renal function is impaired. The present study was carried out with male, anesthetized Wistar rats, which received a single intravenous dose of 10 mg thallium/kg, expressed as Tl(I). Urine was collected for three hours via a bladder catheter. The urinary volume and the amounts of T(II), Na(I), and Cl(I) excreted were established. Thallium itself induced a weak diuretic effect, accompanied by an accelerated loss of potassium. This effect somewhat resembles that of mercury diuretics. Thallium excretion amounted to approximately 2.3% of the injected dose during 3 h. The rate of Tl(I) excretion was doubled upon intravenous injection of furosemide (6 mg/kg) or ethacrynic acid (2.5 mg/kg). A higher dose of ethacrynic acid (25 mg/kg) increased Tl(I)-excretion until three times the control value. The accelerated excretion of Tl(I) was accompanied by a parallel increase in the elimination of K(1). This might suggest that the Tl(I) the mechanism of renal elimination is similar to that of K(I). This significant acceleration of thallium by potent diuretic agents may offer alternative possibilities of treatment of thallotoxicosis. (Author abstract by permission)

77-1779. Deml, E. (Abt. Toxicol., Gesellsch. Strahlen-Umweltforsch., 8042 Neuherberg, Germany). **Plasma protein binding and distribution of polychlorinated biphenyls (PCBs) and chlorinated hydrocarbons in blood.** *Naunyn Schmiedebergs Arch. Pharmacol.* 297(suppl. 2): R21; 1977.

The binding to serum proteins of five chlorinated biphenyls (4-Cl-B,2,2′-DCB, 2,5,2′5′-TCB, 2,4,6,2′4,′6′-HCB and 2,3,5,2′3′5′-HCB) and three chlorinated hydrocarbon insecticides (DDT, dieldrin and lindane) was investigated by equilibrium dialysis and determination of solubility in protein solutions. More than 90% of the total amount in solution are bound to serum albumin (1 mg protein/ml, 3°C). Lindane was bound not more than 70% under the same conditions. More than 99% of 2,2′-DCB are bound to α- and β-globulins. In contrast, γ-globulin binds only 31%. The percentage bound of PCBs and chlorinated insecticides to bovine plasma is more than 99%. The binding capacity of bovine serum albumin and plasma for the different compounds correlates with solubility in phosphate buffer (between 2.6 μM/l for 2,2′-DCB and 3 μM/l for DDT). The binding capacity of α- and β-globulins for 2,2′-DCB amounts to 80% and 58% respectively of the capacity of albumin. Distribution of the compounds tested in whole blood in vitro is mainly determined by total binding capacity of proteins in plasma: 80-90% of the amount in normal blood are bound to plasma proteins. With the exception of 2,2′-DCB (56% in plasma), PCBs and chlorinated hydrocarbon insecticides do not differ significantly in their distribution between cellular components and soluble proteins of blood. Consequently, transport of these compounds in the blood is mediated by plasma protein binding; albumin is the main transport protein. (Author abstract by permission) (Abstract no. 82)

77-1780. Hutson, D. H.; Crayford, J. V.; Hoadley, E. C. (Shell Res. Ltd., Tunstall Lab., Sittingbourne Res. Ctr., Sittingbourne, Kent, England). **The fate of the herbicide flamprop-isopropyl (Barnon) in rats and dogs.** *Xenobiotica* 7(5): 279-300; 1977. (6 references)

[^{14}C]Flamprop-isopropyl (Barnon) administered orally to rats and dogs is excreted mostly via the feces (90.5% and 76.3% in male and female rats respectively and 53% in dogs). Elimination was rapid from both species, and > 96% of the dose of ^{14}C was excreted by rats 0-48 hr after dosing. Distribution of ^{14}C between urine and feces was different in male and female rats, but the same for dogs of either sex. The predominant metabolic pathway in both species was loss of the isopropyl group; the resulting carboxylic acid was excreted free and as the ester glucuronide. Aromatic hydroxylation occurred at the *para*- and *meta*-positions of the *N*-benzoyl ring; the presence of a 3,4-dihydroxybenzoyl metabolite (but no dihydrodiol) suggests that arene oxide formation is involved. However, direct hydroxylation at position 3 cannot be precluded. Aromatic hydroxylation occurred with the following facility (0-48 h): male rat, 18%; female rat, 13%; dog (either sex), 2%. Hydroxylation occurred readily in the isopropyl side chain, yielding mostly a propan-1,2-diol ester in the dog. In the rat, this metabolite was mostly oxidized to yield a 2-lactyl ester. (Author abstract by permission)

77-1781. Declume, C.; Benard, P. (Lab. Radioelements Etudes Metabol., Ecole Nat. Vet., 31076 Toulouse-Cedex, France). **Etude autoradiographique de la distribution d'un agent anticholinesterasique, le 1-naphthyl-*N*-methyl ^{14}C carbamate, chez la ratte gestante. [Autoradiographic investigation of the distribution of carbaryl, an anticholinesterase compound, in the pregnant rat.]** *Toxicol. Appl. Pharmacol.* 39(3): 451-460; 1977. (17 references) (French)

1-Naphthyl-*N*-methyl [^{14}C]carbamate (carbaryl), an anticholinesterase, was given orally to pregnant female rats (day 18). Each rat received 13.5 μCi and was killed 1, 5, 8, 24, 48, 72, and 96 hr later. Whole-body autoradiography was performed. We noted a placental transfer of radioactivity beginning with the first hr. The ^{14}C concentration in the fetus was relatively constant from 8 to 96 hr. There was localization in the eye, liver, and brain of the fetus. In the mother, ^{14}C activity was seen in the excretory organs. A localization was noted in bones (medullar), in the digestive tract (wall), and in the brain. Although the major portion of the carbaryl was quickly eliminated, some areas of radioactivity remained in the pregnant rat after

oral administration of [^{14}C]carbaryl. This localization occurred particularly in highly active protein building organs (fetus, digestive tract, medullar part of bones). (Author abstract by permission)

77-1782. Kaplan, A. M.; Sherman, H. (E. I. du Pont de Nemours Co. Inc., Cent. Res. Develop. Dep., Haskell Lab. Toxicol. Indust. Med., Newark, DE 19711). **Toxicity studies with methyl *N*-(((methylamino) carbonyl)oxy) ethanimidothioate.** *Toxicol. Appl. Pharmacol.* 40(1): 1-17; 1977. (28 references)

Methomyl exhibited a low order of chronic oral toxicity even though it exhibited high acute oral toxicity. When applied dermally to rabbits, aqueous suspensions of methomyl exhibited low acute toxicity. Subacute oral tests in rats indicated no cumulative oral toxicity and plasma cholinsterase activity for test rats was similar to that of the controls. Also, when methomyl was applied to intact skin of rabbits, 15 daily treatments produced no cumulative effects. Fish residues studies showed no build-up of methomyl in the tissues and no signs of a compound-related effect were noted in a 30-day feeding study in Japanese quail. Methomyl fed to pregnant New Zealand white rabbits on Days 8-16 of gestation at dietary levels of 0, 50, and 100 ppm was not teratogenic. In a 3-generation, 6-litter reproduction study with rats, at the same dietary levels, methomyl had no adverse effects upon reproduction and lactation performance; no pathologic changes were observed in weanling pups of the F3b generation. The oral administration of 28 mg/kg to adult hens did not result in demyelination of the sciatic nerve. Rats of both sexes were fed nutritionally complete diets containing 0, 10, 50, 125-500, and 250 ppm of methomyl in a 90-day feeding study and 0, 50, 100, 200, and 400 ppm of methomyl in a 22-month feeding study. The weight gain for the high-level males was significantly lower than that of the controls. No clinical, hematological, biochemical, urinary, or pathologic evidence of toxicity was observed at 90 days. However, in the 22-month study, decreased hemoglobin values were noted in the two higher level female test groups. A significantly higher testis/body weight ratio was observed in the high-level males. Histopathologic alterations were observed in the kidneys of male and female rats receiving 400 ppm and the spleens of the female rats receiving 200 and 400 ppm of methomyl. Beagle dogs of both sexes, fed nutritionally complete diets containing 0, 50, 100, and 400 ppm of methomyl in 90-day and 2-year feeding studies, showed no nutritional, clinica, urinary, or biochemical evidence of toxicity; in the latter study, an additional dietary level of 1000 ppm caused some clinical signs of toxicity and mortality. Similar to the findings in the 22-month feeding study in rats, histopathologic changes were observed after 2 years in the kidney and spleen as well as in the liver at the two higher feeding levels. In addition, dogs receiving the high-level diet showed a compound-related anemia. There was no evidence of carcinogenicity at any levels in either rats or dogs. Based on the results of the long-term studies, the "no-effect" level was determined for rats and dogs to be 100 ppm. (Author abstract by permission)

77-1783. Hodgson, J. R.; Lee, C. C. (Pharmacol. Toxicol., Midwest Res. Inst., Kansas City, MO 64110). **Cytotoxicity studies on dithiocarbamate fungicides.** *Toxicol. Appl. Pharmacol.* 40(1): 19-22; 1977. (6 references)

The cytotoxicity of selected metal-containing dithiocarbamate fungicides was determined using Chinese hamster ovary cells (CHO-K1) in culture. Bis(dimethylthiocarbamoyl)disulfide (thiram) and ferric dimethyldithiocarbamate (ferbam) were more toxic, having LC50 values of 0.5 n*M* and 0.7 n*M*, respectively, whereas manganese ethylene bisdithiocarbamate (maneb) and zinc ethylene bisdithiocarbamate (zineb) were less toxic, having LC50 values of 3 n*M* and 6 n*M*, respectively. Analysis of the data using "target theory" showed that ferbam, thiram, maneb, and zineb have a common hit number. These studies suggest that these fungicides have a common mechanism of toxicity. (Author abstract by permission)

77-1784. Gordon, J. J.; Leadbeater, L. (Min. Defence., Chem. Defence Establ., Porton Down, Salisbury, England). **The prophylactic use of 1-methyl, 2-hydroxyimino methylpyridinium methanesulfonate (P2S) in the treatment of organophosphate poisoning.** *Toxicol. Appl. Pharmacol.* 40(1): 109-114; 1977. (9 references)

Studies have been carried out to determine the effects of prophylactic treatment with P2S (1-methyl, 2-hydroxyinimomethylpyridinium methanesulfonate) on the survival of animals poisoned by lethal doses of sarin, soman, tabun, or VX (*O*-ethyl *S*-diisopropyaminoethyl methylphosphonothiolate). There was a significant increase, compared with control animals, in the survival time of rabbits and guinea pigs poisoned by 2.3 LD50 of sarin and VX. With soman and tabun, the increase in the time of survival was slight, but consistent. In every case, the time taken for signs of poisoning to occur was unaffected by the pretreatment. P2S prophylaxis enhanced the effectiveness of therapy with atropine, and P2S given after poisoning with organophosphates had a similar effect, although the extent of the protection against soman poisoning was considerably less than that achieved against poisoning by sarin or VX. (Author abstract by permission)

77-1785. Shain, S. A.; Shaeffer, J. C.; Boesel, R. W. (Tom Slick Mem. Lab., Southwest Fdn. Res. Educ., San Antonio, TX 78284). **The effect of chronic ingestion of selected pesticides upon rat ventral prostate homeostasis.** *Toxicol. Appl. Pharmacol.* 40(1): 115-130; 1977. (18 references)

The ability of the pesticides carbofuran, chlordane, diazinon, heptachlor, methoxychlor, and parathion to diminish 5α-dihydrotestosterone binding to rat ventral prostate cytoplasmic and nuclear androgen receptors was

evaluated by in vitro studies. Only parathion and diazinon consistently inhibited 5α-dihydrotestosterone binding to ventral prostate cytoplasmic or nuclear androgen receptors, the remaining pesticides being relatively ineffective. The data suggested that only parathion and diazinon should be able to affect prostate homeostasis via a mechanism involving altered androgen receptor function. After 90 days of pesticide ingestion, ventral prostate androgen receptor homeostasis was altered in all the rats. Significantly, receptor homeostasis was least affected in diazinon- and parathion-fed rats, whereas ingestion of carbofuran or chlordane produced the most profound changes. Methoxychlor ingestion diminished prostate size and cell content. Carbofuran, chlordane, and parathion, but not heptachlor or diazinon, altered ventral prostate RNA metabolism without affecting cell content. Since pesticide ingestion did not alter mean plasma testosterone concentration, changes in both androgen receptor and prostate homeostasis could be attributed to pesticide action principally occurring in the ventral prostate. The absence of a correlation between pesticide inhibition of 5α-dihydrostestosterone binding to prostate androgen receptors and the pesticide's capacity to alter prostate homeostasis demonstrated inhibition studies to be ambiguous predictors of pesticide action in the ventral prostate. (Author abstract by permission)

77-1786. Gontzea, I.; Gorcea, V. (Nutr. Res. Ctr., Inst. Med. Pharm., Bucharest, Romania). **The influence of protein and fat intake on the body's resistance to dimethoate.** *Med. Lav.* 68(1): 13-21; 1977. (32 references)

A study was performed on four groups of 30 young male white rats weighing 180-200 g. They were housed separately and fed for 10 wk with diet containing varying amounts or protein (normal = 16 g%, low = g%, and high = 24 g%) and fat (normal = 9 g%, high = 18 g%). Half of the rats in each dietary group were treated daily by stomach tube with 10 mg dimethoate/kg body weight, and the other half were oil-treated controls. After 10 weeks the cholinesterase activity was determined in whole blood, plasma, erythrocytes, brain, and liver. The normal diet and especially the high-protein diet significantly reduced the effects of dimethoate on the weight gain of young rats and attenuated the anticholinesterase effects as compared to the low protein diet. High fat diet also exacerbated the adverse effects of dimethoate.

77-1787. Sosnierz, M.; Kita, I.; Kita, K. (Dep. Cytodiagnost., Inst. Pathol., Acad. Med., Katowice, Poland). **Zmiany morfologiczne u szczurow w skroconym zatruciu przewleklym "karbafosem". [Morphological changes in rats during short-term chronic posioning with carbophos.]** *Med. Pr.* 28(2): 91-97; 1977. (14 references) (Polish)

Wistar rats were subjected to short-term chronic poisoning with carbophos (malathion) administered in the diet at 20, 70, 250, and 850 ppm for 13 weeks. After the end of the experiment the animals were killed, and their organs were weighed. The organs were also examined histologically. The kidney weight increased, and the kidneys displayed many nonspecific pathologic-morphological changes. Carbophos treatment was considered directly responsible for the observed pulmonary edema and parenchymatous degeneration of heart, kidneys, and liver. The degree of alteration was related to the dose level. Based on these investigations, the maximum tolerance level for carbophos was established at 20 ppm.

77-1788. Hatfaludi, F.; Somogyi, J.; Antoni, F. (First Inst. Biochem., Semmelweis Univ. Med. Sch., Budapest, Hungary). **The inhibitory effect of chlorophenoxy herbicides on Na K-ATPase and its binding to the enzyme preparation.** *Acta Biochim. Biophys. Acad. Sci. Hung.* 11(2-3): 230; 1976.

Previous studies demonstrated that 2,4,5-trichlorophenoxyethanol resulted in sigmoid-type inhibition curves in the case of both overall ATP hydrolysis and its partial reactions. These results suggested a need for further kinetic studies of the inhibitory mechanism. Trichlorophenoxyethanol was in a non-competitive relationship with the two activating ions, sodium and potassium, and the connections with ATP were noncompetitive. Labeled trichlorophenxyethanol bound instantaneously to the enzyme preparation; the binding was not temperature-dependent and could not be influenced by the sodium-potassium ATPase effectors. Trichlorophenoxyethanol inhibits the binding of cardiac glycosides to the enzyme system, whereas ouabain had no effect on the binding of labeled trichlorophenoxyethanol. Albumin and phosphatidylserine exerted a partial protective effect both on ATP hydrolysis and on the binding of labeled trichlorophenoxyethanol. The effects of the inhibitor could be reversed by either of these substances. The lipid solubility of trichloroethanol is presumed to play the most important role in the process of inhibition by this substance.

77-1789. Doroshchuk, V. P. (Electrophysiol. Sect., All-Union Res. Inst. Hyg. Toxicol. Pestic., Polymers, Plastics, Kiev, USSR). **Vliyanie khloroganicheskikh pestitsidov na funktsiyu *N*-kholinoretseptorov. [Effects of organochlorine pesticides on the function of N-cholinoreceptors.]** *Vrach. Delo.* 1:143-146; 1977. (Russian)

Respiratory muscle potentials were recorded in electrophysiologic experiments on rats aimed at studying the effects of some synaptically active substances (atropine, tubocurarine, anticholinesterase compounds, narcotics) on the process of acute intoxication with polychlorocamphene (toxaphene), polychloropinene (strobane), and lindane. Tubocurarine paralysis development was also examined in respiratory muscles of animals chronically poisoned with low doses (1/20, 1/100, 1/500 LD50) of polychlorocamphene. Tubocurarine blockage of

neuromuscular transmission in acute and chronic poisoning developed 2-2.5 times more rapidly than in controls. The convulsions which developed could be controlled with soporific drugs. Atropine does not affect the course of poisoning, whereas anticholinesterase agents sharply increase the convulsive state before onset of depolarization. The results suggest that the principal action mechanism of organochlorine pesticides comprises a marked increase in a sensitivity of *N*-cholinoreceptors to acetylcholine (hypersensitization).

See also **77-1572**

77-1790. Silvestri, R. (Dept. Pharmacol., Fac. Cienc. Vet., Univ. Central de Venezuela, Maracay, Venezuela). **New techniques to measure blood cholinesterase activity in domesticated animals.** *Am. J. Vet. Res.* 38(5): 659-662; 1977. (8 references)

A macro method and a semimicro method were developed to measure erythrocyte acetylcholinesterase activity in cattle, sheep, goats, horses, dogs, and swine, and to measure plasma cholinesterase activity in horses, dogs, and swine. Comparison of the two methods with erythrocytes of sheep, cattle, goats, and horses indicated that both methods gave similar results. The methods can be done in a shorter time and are more sensitive than Michel's method. Normal differences in pH values per minute, with standard deviations for blood cholinesterase activity of animals of different ages, sexes, breeds, and species were: 0.76 ± 0.12/30; 0.65 ± 0.10/15; 0.69 ± 0.19/45; 0.78 ± 0.11/45; 0.63 ± 0.11/45; and 0.71 ± 0.06/25 for sheep, cattle, goats, horses, dogs, and swine erythrocyte acetylcholinesterase, resp.; and 0.66 ± 0.18/20 0.67 ± 0.20/30, and 0.46 ± 0.05/60 for horses, dogs, and swine plasma cholinesterase, respectively. It was shown that either the chloride or the iodide salt of acetylcholine can be used as the enzyme substrate. In blood samples stored at 5°C for 24 hours, there was no significant change of the enzymatic activity.

77-1791. Kvalvag, J.; Elliott, D. L.; Iwata, Y.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92502). **Comparison of analytical results obtained by gas and by high-pressure liquid chromatography of parathion and paraoxon in extracts prepared from orchard soil dust and dislodgable residues on orange leaves.** *Bull. Environ. Contam. Toxicol.* 17(3): 253-260; 1977. (16 references)

Gas chromatography (GC) and high-pressure liquid chromatography (HPLC) were used to analyze parathion and paraoxon residues on surface soil dust and leaf disc samples obtained from a California orange grove which had been sprayed 17-60 days earlier with a 25% WP parathion formulation. Analysis of the samples by both methods showed a fairly wide concentration range of parathion and paraoxon contamination in the dust and foliage samples. There was no systematic disagreement in either the qualitative or the quantitative analytical results for parathion by GC and HPLC. Although the results appeared to be systematically a little higher for paraoxon when GC was used, the difference was not significant when the magnitude of the standard deviations was taken into account. Due to the rapidity of sample analysis, however, GC is the technique of choice for quantitation of samples containing parathion and paraoxon. The good agreement of the HPLC and GC results for paraoxon is an indirect proof of its identity and occurrence as foliar dislodgable residues on citrus leaves and in orchard soil dust.

77-1792. Ott, D. E. (Dep. Entomol., Univ. California, Riverside, CA 92502). **Liquid chromatography of parathion and paraoxon with a relatively specific colorimetric autoanalyzer system on-stream as secondary detector or an ultraviolet absorption detector.** *Bull. Environ. Contam. Toxicol.* 17(3): 261-268; 1977. (9 references)

Soil surface dust samples from a California orange grove sprayed 17-60 days earlier with a 25% WP parathion formulation were analyzed using a spectrophotometric detector liquid chromatograph coupled to an AutoAnalyzer system. In this system, the AutoAnalyzer system responded to aromatic nitrogroup-containing compounds. For this detector under the conditions used, including no scale expansion of response, the minimum detectable levels of paraoxon and parathion were approximately equal, around 0.1 μg. Although an AutoAnalyzer colorimetric system used as a liquid chromatographic detector offers less quantitative reproducibility than an ultraviolet detector, the lower precision of the former is largely compensated by its greater specificity when compared with the latter. The system can be easily made to determine azinphosmethyl by simple substitution of one of the reagents pumped into the detector, so that the colorimetric detector is also potentially applicable for the determination of methyl parathion and methyl paraoxon.

77-1793. Lee, M. K.; Serat, W. F. (Epidemiol. Studies Prog., State Dep. Health, Berkeley, CA 94704). **A simple method for cholinesterase determination using an expanded scale pH meter.** *Bull. Environ. Contam. Toxicol.* 17(3): 331-341; 1977. (4 references)

A method for cholinesterase determination is described which is a hybrid of the Michel, Couville-Ledington, and pH Stat methods. It utilizes the characteristics of a carbonate-bicarbonate solution which has maximum buffering capicities at pH 6.46 and pH 10.30 and a region of minimum buffering capacity between pH 8.70 and pH 8.10. Although actually sigmoidal, a reasonable linear relationship can be attained in this region between the amount of acid formed by enzymatic hydrolysis of acetylcholine and the pH change in a defined amount of carbonate-bicarbonate solution. The carbonate-bicarbonate solution can be titrated with standardized hydrochloric acid in this chosen pH region for a conversion factor that related Δ pH units per minute per milliliter of sample to μmoles H+ per minute per milliliter of sample. The use of micropipettes permits cholinesterase determinations on micro amounts of blood. Accurate, heparinized disposable glass micropipettes can be used to collect blood and to determine the cholinesterase activities in red blood cells, plasma, and whole blood.

77-1794. Johnson, E. R.; Yu, T. C.; Montgomery, M. L. (Dep. Agr. Chem., Oregon State Univ., Corvallis, OR). **Trapping and analysis of atmospheric residues of 2,4-D.** *Bull. Environ. Contam. Toxicol.* 17(3): 369-372; 1977. (2 references)

A method was developed for trapping and analyzing low levels of 2,4-D in the atmosphere using XAD-2

resin as an adsorption medium. Two types of air-sampling devices were used: a small tube designed for continuous use at a fixed station, and a larger tube designed for large flow rates (50 l/min) and for use with a portable, battery-powered pump. Recovery studies were run on the nonvolatile acid and salt forms of 2,4-D. Hexane extracts of the field run samples obtained using the two sampling devices were analyzed by electron capture gas chromatography; the methyl ester from the nonvolatile forms was run on a microcoulometric detector. The average and range of recoveries of the various esters were: isobutyl, 95 and 92-99%; butoxyethyl, 86 and 79-92%; and propyleneglycobutylether ester, 86 and 79-92%. The unvolatilized ester ranged from 0-4%. The average recovery for all runs was 98%. Similar results were obtained with both sampling devices. The limit of sensitivity of these procedures is about 0.01 $\mu g/M^3$ of 2,4-D with the small samplers and 0.05 $\mu g/M^3$ of 2,4-D with the larger tubes.

77-1795. Kurtz, D. A. (Pesticide Res. Lab., Pennsylvania State Univ., University Park, PA 16802). **Adsorption of PCB's and DDT's on membrane filters — a new analysis method.** *Bull. Environ. Contam. Toxicol.* 17(4): 391-398; 1977. (21 references)

A new adsorption method is described by which PCB mixtures, DDT isomers, and other chlorinated hydrocarbon residues can be efficiently separated from water sources. Aroclor 1242 and Aroclor 1254, as well as *p,p'*-DDT were efficiently adsorbed onto the surface of the adsorption medium, a membrane filter made from cellulose triacetate material. In contrast, desorption of these constituents from the filter was both inefficient and inconsistent. Recovery of the Aroclors was always greater and more consistent than recovery of *p,p'*-DDE, *p,p'*-DDT, *p,p'*-TDE, *o,p'*-DDT, and aldrin. The high degree of adsorption of organochlorine compounds exhibited by the cellulose triacetate membrane filters is of potential value for both analysis and purification. This type of filter might also be applicable to the study of air pollution problems.

77-1796. Gomes, E. D. (Texas State Dep. Health, Epidemiol. Studies Prog., San Benito, TX 78586). **Determination of toxaphene by basic alcoholic hydrolysis and Florisil separation.** *Bull. Environ. Contam. Toxicol.* 17(4): 456-462; 1977. (6 references)

A dehydrohalogenation method for the determination of toxaphene in the presence of other organochlorine pesticides is described. A toxaphene standard was prepared and refluxed with 50% methanolic potassium hydroxide (w/v). The solution was then shaken with water and petroleum ether and separated, the separation procedure being repeated three times followed three additions of water. The petroleum ether layer was evaporated and pipetted onto column containing 60/100 mesh pesticide residue grade florisil. The column was eluted with petroleum ether in two fractions, which were analyzed by electron capture gas chromatography. The relative retention time of the major peak of activity isolated after elution of the toxaphene standard on the florisil column was 1.01 using a 10% DC-200 chromatographic column. On an OV17/OV210 column, the retention time was 1.32. The peak height of the spiked peak on the gas chromatograph was linear with concentration. The spiked peak was specific for toxaphene with little or no interference from pesticides such as chlordane, Strobane, and PCBs, which usually interfere with the determination of toxaphene.

77-1797. Moolenaar, A. J.; Niewint, J. W. M.; Oei, I. T. (Dept. Chem. Pathol., Univ. Hosp., Leiden, The Netherlands). **Estimation of *o,p'*-DDD in plasma by gas-liquid chromatography.** *Clin. Chim. Acta* 76(2): 213-218; 1977. (9 references)

A method is described which allows the estimation of *o,p'*-DDD in plasma. To 50 μl plasma, 0.2 ml acetone is added. The mixture is then extracted with 2 ml *n*-heptane containing *p,p'*-DDD as an internal standard. Water is removed by adding desiccated sodium sulfate. The organic phase can be injected into a gas chromatograph equipped with an electron capture detector. The *o,p'*-DDD content of the sample can be read from a calibration curve. Recovery of *o,p'*-DDD added to plasma is over 93%. The same procedure may be used for the estimation of *o,p'*-DDE.

77-1798. Kawana, K.; Nakaoka, T.; Fukui, S. (Dept. Food Drugs, Kanagawa Pref. Public Health Lab., Yokohama, Kanagawa, Japan). [**Determination of piperonyl butoxide and results on detection in commercial rice grains.**] *Kanagawa-Ken Eisei Kenkyusho Kenky Hokoku (Bull. Kanagawa Pref. Public Health Lab.)* 6:33-36; 1976. (10 references) (Japanese)

After examining the feasibility of gas chromatography for determination of piperonyl butoxide, used as a synergist for pyrethrin, it was found that the calibration curve showed linearity in the range of 25-250 ppm. The removal of interfering peaks in the gas chromatogram due to the extract of rice grain by silica gel column chromatography was successful. No residues of piperonyl butoxide were detected in 17 specimens of commercially available rice grains by this method.

77-1799. Kaniwa, M.; Mori, J.; Kojima, S.; Nakamura, A.; Oba, T. (Natl. Inst. Hyg. Sci., Tokyo, Japan). [**Analytical method for dieldrin used as a moth proofing agent in wool fabrics.**] *Eisei Kagaku (J. Hyg. Chem.)* 23(1): 7-12; 1977. (8 references) (Japanese)

An improved method for determining dieldrin in wool fabrics was established. In this method, ethanol and a 1:1 mixture of acetone and methanol were successfully used for extracting dieldrin from the fabric; the percentage extraction was 90-100%. Using this method, several wool fabrics were analyzed for dieldrin. The background value was 0.02-0.32 $\mu g/g$ of specimen. The results of determinations of dieldrin in raw wool, regenerated wool, and wool

fabric showed that evening wear fabrics such as doeskin and tuxedo-cloth as well as muslin and blanket material had been treated with dieldrin. The reported values obtained were 0.19-166, 183, 1.93-109, and 0.10-352 μg/g of specimen.

77-1800. Ukai, S.; Hirose, K.; Kawase, S. (Gifu Coll. Pharm., Gifu, Japan). [**Forensic chemical studies on drugs and chemicals III. Gas-chromatography of reduction-products of herbicide "diquat and paraquat".**] *Eisei Kagaku (J. Hyg. Chem.)* 23(1): 32-38; 1977. (13 references) (Japanese)

Diquat dibromide (I) and paraquat dichloride (II) were determined by gas chromatography of the perhydrogenated products obtained by treating them with sodium borohydride and a transition metal salt such as nickel (II) chloride. The reduction products were resolved by gas chromatography with HFD; the column being packed with 5% potassium hydroxide plus 5% PEG 20 M on Gas-chrom Z, at a temperature of 175°C, using N_2 as a carrier gas at 30 ml/min. It was found that the procedure is well suited for assaying diquat and paraquat at 10-90 μg/ml of water using *p*-anisidine as internal standard. The reduction products of (I) and (II) were identified as a mixture of *trans*-and *cis*-perhydrodpyrido [1,2-a:2',1'-c] pyrazine, and 1,1-dimethyl-4,4'-bipiperidine, respectively. The same compounds were formed when (I) and (II) were reduced, respectively, using platinum oxide as catalyst.

77-1801. Ukai, S.; Hirose, K.; Kawase, S. (Gifu Coll. Pharm., Gifu, Japan). [**Forensic chemical studies on drugs and chemicals IV. Determination of morphamquat in aqueous herbicide formulations by gas chromatography.**] *Eisei Kagaku (J. Hyg. Chem.)* 23(2): 83-86; 1977. (10 references) (Japanese)

A gas-chromatographic method for determination of morphamquat (*N,N'*-bis (3,5-dimethyl- morpholino carbonylmethyl)-α,α- bipyridylium salt), used as an active ingredient of an aqueous herbicide formulation (not yet registered in Japan), was described. Morphamquat is first reduced with sodium borohydride alone or a sodium borohydride nickel(II) chloride system. The reduction product, identified as *N,N'*-bis (3,5-dimethyl-morpholinocarbonylmethyl)-αα- bispiperidine by mass spectra and IR spectrogram, was analyzed with a gas chromatograph with FID. The column was packed with 1% SE-30 on Gas-chrom Z at 290°C, and nitrogen was used as the carrier gas at 30 ml/min. The above-mentioned reduction system was found well suited for assaying the herbicides at 40-300 μg/ml of water with dimethyl-POPOP as internal standard.

77-1802. Burke, J.; McMahon, B. (Div. Chem. Phys., Bureau of Foods, FDA, Washington DC). **Analysis of food for residues of pesticides.** *FDA By-Lines* 7(4): 207-223; 1977. (46 references)

This paper focuses on multiresidue analyses for the purpose of monitoring and regulatory surveillance, and uses as examples the programs and methods used by the United States FDA. These procedures and methods are capable of simultaneously detecting and measuring several residues in single samples and are applicable to a wide range of commodity types. Food analysis requires a system which is able to cope with the following factors: a large number of commodities of varied physical and chemical composition; potential residues of a large number of pesticides and alteration products comprising a wide range of chemical properties; residues resulting from direct application, from translocation from the soil, or from ingestion by animals; and the need, based on legal and/or toxicological considerations, for different limits of quantitation for different residues. The total analytical process is divided into two major parts and discussed accordingly. These two parts are: that which precedes carrying out the analytical method, i.e., sampling, sample preparation, and sample storage; and the analysis itself, which typically consists of the operations of extraction, cleanup, and determination, including confirmation of residue identity, carried out in a prescribed sequence. Specific methods of analyses are considered.

77-1803. Cairns, T.; Jacobson, R. A. (US-FDA, Los Angeles, CA 90015). **New approaches to FDA analytical problems.** *J. Chem. Inform. Computer Sci.* 17(2): 105-109; 1977. (4 references)

During normal surveillance analyses for pesticide residues, compounds often are encountered which cannot be readily identified by available gas chromatographic data. The need for a listing containing all possible compounds that might be so encountered is long overdue. Such a data base has been initiated and at the moment contains 1650 compounds which have been computer sorted according to molecular weight. Sample lists are diagrammed and examples of the uses to which the system can be put are provided. It is anticipated that additional compounds and metabolites will be added to the list as they are reported in the literature. An attempt to record all mass spectral data is currently underway as a joint effort within FDA labs. Simultaneously, available mass spectral data are being forwarded to EPA for inclusion in the Cyphernetics MSSS file system. In the case of PCB quantitation, plans are already in process to refine the chemical profiling techniques and quantitate on the basis of individual isomeric groups (mono-, di-, tri-, etc.) rather than related to an Aroclor standard mixture.

77-1804. Dolphin, R. J.; Hoogeveen, L. P. J.; Willmott, F. W. (Mullard Res. Labs., Redhill, Surrey, England). **An experimental system for the automatic determination of organochlorine residues in milk.** *Philips Tech. Rev.* 36(10): 284-290; 1976. (5 references)

An experimental monitor is described that automatically determines ten organochlorine residues in

milk, including DDT, DDE, lindane, hexachlorobenzene, and the polychlorinated biphenyls (PCBs). A modular construction has been adopted and each module has its own function: the pretreatment of a sample, the separation into distinct constituents and 'regeneration' of the apparatus, and detection. A microcomputer performs the required calculations and has a number of control functions. The monitor uses a bubble-train extractor, high-performance liquid chromatography with two separation columns, and a new application of electron-capture detection. Rapid analyses can be performed (two samples an hour), permitting accurate determination with low detection limits of the specified residues and the fat content of the milk.

77-1805. Irie, S.; Yuki, F.; Murano, A. (Inst. Biol. Sci., Sumitomo Chem. Ind. Co., Ltd., Takarazuka, Hyogo, Japan). [**Gas chromatographic determination of denmert R, a new fungicide.**] *Nippon Nogei Kagaku Kaishi (J. Agric. Chem. Soc. Jpn.)* 51(5): 331-333; 1977. (3 references) (Japanese)

A method was devised for determining *S-n*-butyl *S'-p-tert*-butylbenzyl *N*-3-pyridyldithio carbonimidate (Denmert), pure and in formulations, using gas chromatography. Denmert could be separated from its meta-isomer and other impurities using column chromatography with PEG 20M. The conditions of gas chromatographic determination were: column packed with 2% PEG 20M/chromosorb W; column temp. 220°C; temperature of injection port and detector, 270°C; carrier gas, N_2 at 80 ml/min; FID; and 1,3,5-triphenylbenzene as internal standard. The recovery from formulation was 99.78, 99.86 and 100.12% for EC, WP and granules. Separating the impurities with the same chromatographic column and analyzing each of them by gas chromatography and mass-spectrography revealed that technical denmert generally contains about 2% of the *meta*-isomer, and less than 1% of 2-bromo- 4-*tert*-butyl- toluene, *p-tert* butylbenzaldehyde, *p-tert*-butylbenzyl bromide, *p-tert*- butylbenyl *n*-butyl sulfide, *p-tert*-butylbenzalbromide, *S,S'*-di-*n*-butyl *N*-3 pyridyldithio carbonimidate, di(*p-tert*- butylbenzyl) sulfide, and *O*-methyl *S-p-tert*-butylbenzyl thiocarbonimidate.

77-1806. Shiga, N.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). [**Microdetermination of residues of benomyl and thiophanate-methyl.**] *(J. Pestic. Sci.* 2(1): 27-32; 1977. (7 references) (Japanese)

Residue analysis of benomyl and thiophanate methyl [dimethyl 4,4-*o*-phenylene-bis 3-thioallophanate] (TM) in various plants and soil was studied. Since methyl 2-benzimidazole carbamate (MBC, carbendazim), which was derived from both fungicides, has a specific fluorescence spectrum, the pesticide residues were extracted with ethyl acetate (benomyl) or methanol (TM) and purified by solvent transfer into dichloromethane. Benomyl was hydrolyzed under alkaline conditions, and TM was ring-closed in the presence of copper acetate to form MBC. MBC was determined by a high-speed liquid chromatograph with fluorescence spectrophotometer as a detector. The limit of determination was 0.008 ppm of benomyl in vegetables and 0.03 ppm of TM in soil. The method was applicable to benomyl in soils, cucumber, tomato, peach (pulp and peel) and Satsuma orange (pulp and peel) and to TM in soils. The exciting wavelength and fluorescence wavelength of MBC were 285 and 315 nm, respectively.

77-1807. Tomita, M.; Nishimura, M. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan). [**Studies on the determination of 3,4-dichloroaniline in urine.**] *Sangyo Igaku (Jpn. J. Ind. Health)* 18(2): 521-527; 1977. (16 references) (Japanese)

3,4-Dichloroaniline (3,4-DCA) has been detected as a metabolite or decomposition product of herbicides such as swep and propanil in plants and soil. These herbicides or 3,4-DCA, once ingested into the human body, are mainly excreted in the urine. Studies were carried out to establish a method for determination of 3,4-DCA in urine by gas-chromatography with ECD. A 50ml urine specimen was acidified to a pH less than 1 by adding 1 - 2 ml of conc. HCl; then hydrolysis was conducted at 60°C for 20 min, and the pH of the hydrolysate was made weakly alkaline. The 3,4-DCA formed was extracted with 10 ml of benzene. The emulsion containing benzene and 3,4-DCA was centrifuged at 300 ppm and the solvent layer was injected onto the gas chromatograph. The limit of detection was 0.1 μg of 3,4-DCA in one ml of urine, and an average recovery of 91% was achieved 3,4-DCA was present at 5 μg per ml of urine. The values obtained by the present method and the ultraviolet method coincided fairly well.

77-1808. Totir, N.; Marchidan, S.; Volanschi, C.; Cimpoeru, N.; Andrei, R. (Cent. Inst. Chem., Min. Chem. Ind., Bucharest, Romania). **Dozarea erbicidelor *s*-triazinice** [**The determination of *s*-triazine herbicides.**] *Rev. Chem. (Bucharest)* 27(6): 523-526; 1976. (51 references) (Romanian)

Physicochemical methods for the determination of *s*-triazine herbicides are reported in a review; their advantages and disadvantages are examined. U.V. spectrophotometry—based on the hydrolysis of *s*-triazines and subsequent determination of the hydroxy derivatives—and I.R. spectrophotometric determinations are first described. Colorimetric methods based on the reaction between *s-triazine and pyridine in alkaline solution* < are considered inefficient due to the instability of the chromophore. Polarography by classical or voltammetric methods is unable to distinguish between various *s*-triazines in a mixture, and can only be used if the search compound has been previously extracted. Gas chromatography is reported as widely used and most useful for the determination of *s*-triazine herbicide residues. Various detectors (flame ionization, microcoulometric titration,

flame photometer, electrolytic conductivity, electron capture, thermionic with alkaline flame) and column assemblies are discussed. The thermionic alkaline flame detector is reported as the most suitable for the quantitative determination of *s*-triazine residues, especially phosphorus and nitrogen containing compounds, in cereals, soils and water, with a detection range of 0.05-0.02 μg and sensitivity of 0.001 ppm. Paper chromatography is not widely used due to its low sensitivity. Various methods of thin-layer chromatography were used in the determination of a large number of *s*-triazines; the sensitivity of the method is reported as relatively low.

77-1809. Blackmer, G. L.; Reynolds, R. H. (Dep. Chem., Texas Tech Univ., Lubbock, TX 79409). **A semiquantitative method for the detection of microcapsule residues resulting from microencapsulated pesticide applications.** *J. Agric. Food Chem.* 25(3): 559-561; 1977. (13 references)

The detection of ethylenediamine is used as a diagnostic test for the presence of residual microcapsules occurring in crop commodities as a result of encapsulated pesticide applications. Samples to be analyzed for microcapsule residues are dehydrated, degraded in caustic ethylene glycol solution under reflux, fractionally distilled, and monitored for ethylenediamine content spectrofluorometrically. (Author abstract reprinted by permission of the American Chemical Society)

77-1810. Selim, S.; Cook, R. F.; Leppert, B. C. (FMC Corp., Agric. Chem. Div., Richmond, CA 94804). **Determination of residues of karbutilate and its major metabolites in water, soil, and grass by high-pressure liquid chromatography.** *J. Agric. Food Chem.* 25(3): 567-572; 1977. (17 references)

A high-pressure liquid chromatographic (HPLC) method was developed for the determination of residues of karbutilate (3-[[(dimethylamino)carbonyl]amino] phenyl (1,1-dimethylethyl) carbamate), its hydrolysis product *N'*-(3-hydroxyphenyl)- *N,N*-dimethylurea and its demethylated metabolites monomethyl karbutilate (3-[[(methylamino)- carbonyl) amino] phenyl (1,1-dimethylethyl) carbamate) and demethyl karbutilate (3-[(aminocarbonyl) amino]phenyl (1,1-dimethylethyl) carbamate), in water, soil, and grass. Recoveries of karbutilate and its degradation products from water ranged from 89 to 103%. The lower limit of sensitivity of the method is 0.01 ppm for karbutilate and *N'*-(3-hydroxyphenyl)-*N,N*-dimethylurea and 0.01 ppm for monomethyl karbutilate. The recovery of karbutilate and its carbamate metabolites from soil ranged from 84 to 95%. For residues in grass, the carbamates are converted to the corresponding phenols, which are analyzed by HPLC. The recovery of karbutilate and its carbamate metabolites from grass ranged from 80 to 87%. The lower limit of sensitivity of the method for residues in soil and grass is 0.1 ppm for karbutilate and 0.2 ppm for monomethyl karbutilate and demethyl karbutilate. (Author abstract reprinted by permission of the American Chemical Society)

77-1811. Thornton, J. S.; Olson, T. J.; Wagner, K. (Chemagro Agric. Div., Mobay Chem. Corp., Kansas City, MO 64120). **Determination of residues of Metasystox-R and metabolite in plant and animal tissues and soil.** *J. Agric. Food Chem.* 25(3): 573-576; 1977. (17 references)

A gas chromatographic procedure is described for the analysis of residues of Metasystox-R and its sulfone metabolite in a wide variety of plant and animal tissues and soil. Varied extraction procedures are described for most efficient removal of residues from specific samples of differing physical characteristics. Following this, residues are partitioned into water and then extracted into chloroform, taking advantage of the dual solubility characteristics of the compounds to effect cleanup. The extract is oxidized to convert all active residues to the sulfone, which is then measured by gas chromatography with alkali-flame detection. Recovery for all sample types is generally 80-100% with limit of sensitivity at least 0.01 ppm. (Author abstract reprinted by permission of the American Chemical Society)

77-1812. Ragab, M. T. H. (Agric. Canada Res. Stn., Kentville, Nova Scotia B4N 1J5, Canada). **4-(*p*-Nitrobenzyl)pyridine as a spray reagent for the thin-layer chromatographic detection of diemthyl tetrachloroterphthalate herbicide.** *J. Environ. Sci. Health* B12(2): 155-161; 1977. (18 references)

A thin-layer chromatogram containing DCPA (dacthal) samples and standards is developed with solvent systems comprising benzene, benzene/hexane (1:9), benzene/hexane (1:1), and benzene/acetone (1:1). The chromatogram is then sprayed with 4-(*p*-nitrobenzyl) pyridine chromogenic reagent, followed by ammonium carbonate solution. The chromatogram is heated in an oven at 130°C for 20 min. Then the cooled chromatogram is sprayed with tetraethylenepentamine reagent. The spots containing DCPA appear blue against a white background. The sensitivity of this detector is about 1 μg. The method is useful for detecting DCPA in water and soil.

77-1813. Greathouse, J. E.; Logsdon, D. F., Jr. (Environ. Health Lab., McClellan AFB, California). **An automated system for analysis of environmental levels of technical chlordane.** *Natl. Tech. Inform. Serv.* AD-A024,636, 22 p. 1976.

An automated system for analysis of technical chlordane has been developed. The system consists of an automatic liquid sampler, a gas chromatograph with an electron capture detector, and a dedicated laboratory data system for automatic control and computation of results. Good reproducibility was found, with values comparable to those found using the manual approach. Through the

use of the automated system, a two-to-four-fold increase in analytical capability is possible. This system is adaptable to the automatic analysis of other pesticides and numerous other compounds. (Author abstract by permission)

77-1814. Tomlinson, D. H.; Feller, H. L. (Edgewood Arsenal, Aberdeen Proving Ground, MD). **Improved automated analysis for nanogram quantities of organophosphorus agents GB and VX.** *Natl. Tech. Inform. Serv.* AD-A025,796, 1976, 23 p.

Modification of a technique developed by USAEHA has provided a faster, more sensitive method of analysis for organophosphorus agents, GB (sarin) and VX, than was previously available. Modifications of the equipment, primarily a Technicon Auto Analyzer II (AA II) system, and increased stability of reagents now provide better reproducibility over longer periods with less servicing required. Also, whereas the former method required changes in reagent flow rates (i.e. changes of pump tubes) to switch from GB to VX analysis (or vice versa), this system can be used for both agents without any modifications whatsoever. The total time from sample introduction to readout is about 12 minutes with sensitivity to GB in the range from 0.3 to about 3.5 ng/ml and VX in the range from 0.04 to about 0.5 ng/ml. (Author abstract by permission)

77-1815. Thruston, A. D., Jr. (Environ. Res. Lab., Athens, GA). **A quantitative method for toxaphene by GC-CI-MS specific ion monitoring.** *Natl. Tech. Inform. Serv.* PB-251,931, 30 p. 1976.

A method was developed for the identification and quantification of toxaphene using a Specific Ion Monitoring (SIM) program with GC-CI-MS. Interferences from DDT's and Aroclor 1260 are eliminated or minimized. GC-CI-MS was also used to distinguish toxaphene from strobane. (Author abstract by permission)

77-1816. Thompson, J. F. (Anal. Chem. Br., Health Eff. Res. Lab., Research Triangle Park, NC). **Analytical reference standards and supplemental data for pesticides and other organic compounds.** *Natl. Tech. Inform. Serv.* PB-253,948, 1976, 126 p.

This manual lists several hundred compounds of analytical reference standards of insecticides, herbicides, algicides, nematocides, rodenticides and fungicides which are available, mostly in purified form, in subsamples of 100 milligrams to any bona fide pesticide laboratory in the world free of charge. Also included in the manual are miscellaneous data pertinent to pesticidal compounds such as precautionary notes in the handling and storage of highly toxic compounds, the preparation and storage of solutions of standards, residue methodology references, and an index of over 2,400 pesticide equivalent names. (Author abstract by permission)

77-1817. Junk, G. A.; Richard, J. J.; Fritz, J. S.; Svec, H. J. (Ames Lab., Ames, IA). **Resin sorption methods for monitoring selected contaminants in water.** *Natl. Tech. Inform. Serv.* IS-M-57, 1975, 44 p.

Applications of XAD-2 resin sorption methods for the convenient monitoring of selected lipophilic contaminants in water are discussed. In one extensive study the concentrations of three pesticides, atrazine, DDE and dieldrin, in various surface, sub-surface and finished waters, were measured. The amounts ranged from several micrograms to less than one nanogram per liter (ng/l) of water. Surface water from every major watershed in the State of Iowa (USA) had appreciable levels of contamination, with seasonal and climatic fluctuations which were consistent with an agricultural runoff model. Waters from shallow wells and from water treatment plants were also contaminated. The contamination was either not detected or found at less than one ng/l in water from deep wells located outside the alluvial plain of contaminated rivers. Water treatment processes, even charcoal bed filtration as employed at one modern treatment plant, were shown to be ineffective in reducing the pesticide concentration. Other applications and tests of the resin sorption method for monitoring selected organic contaminants are presented. (Author abstract by permission)

77-1818. Mestres, R.; Chevallier, C. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France). **Methode de recherche et de dosage des residus de pesticides de D.P.C. et de phthalates dans les eaux.** [**Detection and determination of pesticide, PCB, and phthalate residues in water.**] *Ann. Fals. Exp. Chim.* 70(750): 101-111; 1977. (9 references) (French)

Water samples are extracted with a mixture of equal parts of sulfur ether and petroleum ether or petroleum ether alone, then analyzed by gas chromatography with an electron capture detector. If necessary the extract is cleaned up by chromatography on florisil, treatment with mercury, or saponification prior to gas chromatographic analysis. These principles were applied to the determination of the compound types mentioned.

77-1819. Mestres, R.; Chevallier, C.; Espinoza, C.; Cornet, R. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France). **Application du couplage chromatographie gazeuse spectrometrie de masse aux methodes de recherche et de dosage des residus de pesticides et de micropolluants organiques dans les materiaux de l'environnement et les matieres alimentaires.** [**Application of gas chromatography/mass spectrometry to identification and determination of pesticide and organic micropollutant residues in environmental specimens and foods.**] *Ann. Fals. Expert. Chem.* 70(751): 177-188; 1977. (13 references) (French)

The coupled mass fragmentography/gas chromatography technique was developed to permit sensitive and selective analysis of environmental samples. The application of this technique to various environmental

specimens and foods is described for determining organochlorine and organophosphate pesticide, phthalate, and PCB residues.

See also **77-1593** **77-1641** **77-1722**

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

Pesticides Abstracts is available on 16 mm microfilm. Additional information can be obtained from the Technical Services Division.

ORDER FORM FOR
PESTICIDES ABSTRACTS

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Pesticides Abstracts. I am enclosing Money Order ☐ Check ☐ for this subscription.
($18.25 a year; $4.60 additional for foreign mailing.)

Please address as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price, domestic, $18.25 a year, $4.60 additional for foreign mailing. Price for a single copy of this issue is $1.40, Index issue $2.35.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
RM. EB-49, 401 M STREET, S.W.
WASHINGTON, D.C. 20460

POSTAGE AND FEES PAID
FOURTH CLASS RATE BOOK
EPA-335

3EPAPP77378A 001364535006 001
SERIALS DEPT
XEROX UNIVERSITY MICROFILMS
300 NORTH ZEEB ROAD
ANN ARBOR MI 48106

If you do not desire to continue receiving this publication, please CHECK HERE ☐ ; cut off this label and return it to the above address. Your name will then be removed from the mailing list.